STEPHEN M. DIAMOND

THE WESTFIELD RIVER

1975

part d:

Water Quality Management Plan

DIVISION OF WATER POLLUTION CONTROL

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WESTFIELD RIVER BASIN

1975

WATER QUALITY MANAGEMENT PLAN

Water Quality Section
Massachusetts Division of Water Pollution Control

Westborough

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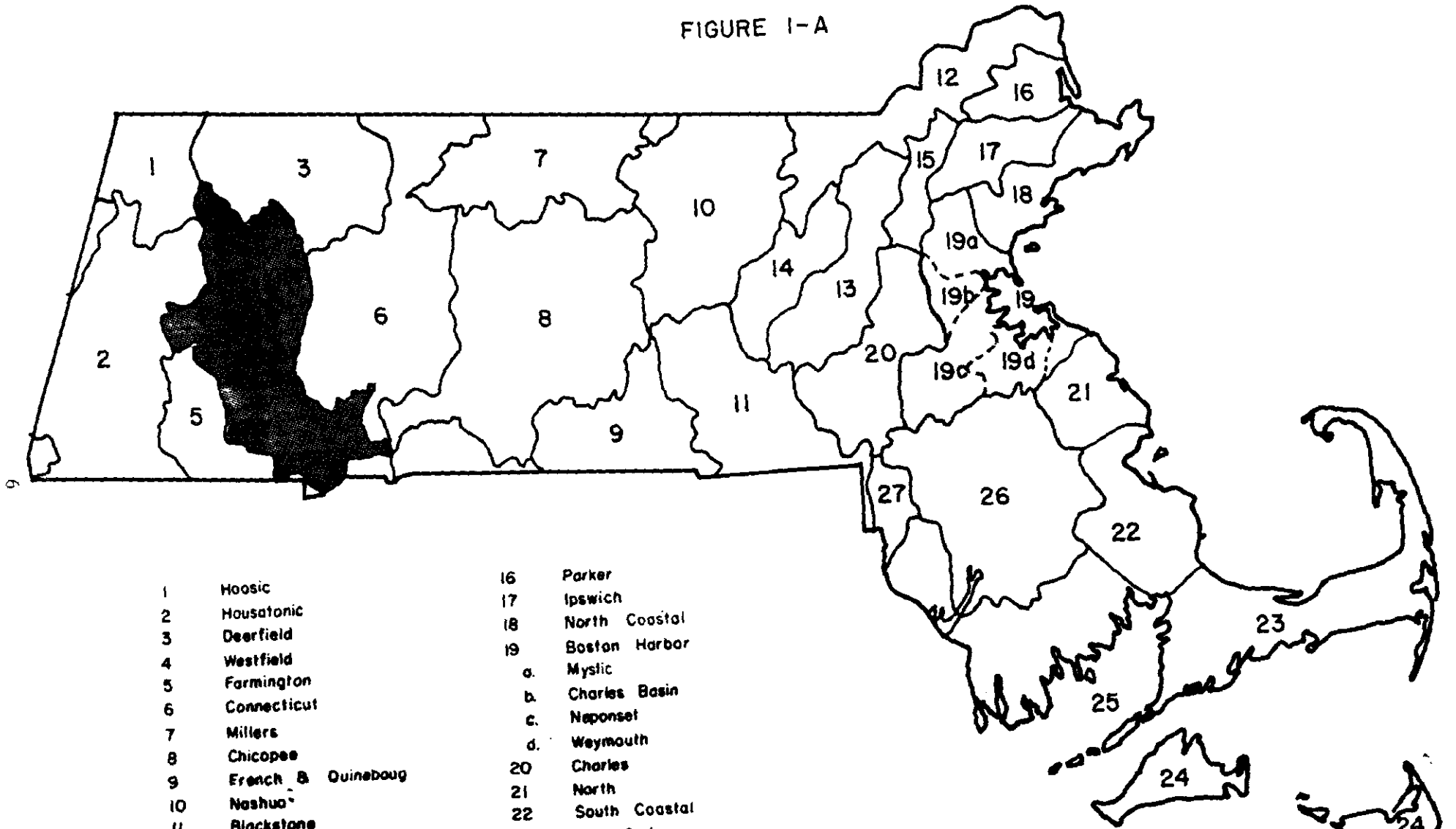

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I. INTRODUCTION

THE WESTFIELD RIVER BASIN

The Westfield River Basin covers 517 square miles of west-central Massachusetts and includes portions of Franklin, Hampshire, Hampden, and Berkshire Counties. The basin's population is concentrated in its southeastern corner in the municipalities of Agawam, Holyoke, Westfield, and West Springfield; the upper reaches of the basin are sparsely populated. Adjacent river basins are the Deerfield to the north, the Connecticut on the east, the Farmington to the south, and the Hoosic and Housatonic to the west.

Historically, the development and settling of the basin is relatively recent. The area remained the western frontier of Massachusetts until the early 1700's. The first settlers were lured to the basin by fur trapping. The region remained isolated until after the Revolutionary War when a rise in industry and commerce brought better lines of communication with the east. Brick making, quarrying, and cattle raising were prominent among the first industries. Later the manufacture of whips and the growing of tobacco dominated. Today, industry in the lower basin continues to broaden its base as it receives the overflow from more populous industrial centers to the east. The rugged upper portion of the basin remains rural with some farming but is used basically for recreation.

The upstream wilderness areas of the West Branch, Middle Branch, and East Branch above their confluences comprise 60 percent of the total drainage area of the basin. The main stem of the Westfield River then flows out of the Berkshire plateau region into the Connecticut Valley lowlands. In the Town of Westfield, it is joined by its major tributary, the Little River. A combination of stream geometry and stream geology have made the Westfield River subject to flooding throughout its history. The August 1955 flood produced the highest flows of record of over 70,000 cubic feet per second along the Westfield. Today, several projects constructed by the Corps of Engineers combine to reduce the threat of serious flooding.

BASIN PLANNING

Political boundaries are generally inappropriate for the definition of planning areas in environmental studies. Water pollution problems in particular do not respect town, county, or state lines. From its inception in 1967, the Massachusetts Division of Water Pollution Control has recognized this fact. Regional offices of the Division serve areas defined by drainage basin boundaries. The original enforcement schedule divided the Commonwealth into the major drainage basins and established concurrent schedules for the elimination of waste discharges in each basin. The goal of that schedule was to realize major improvement in the water quality of each river by calling for the completion of major abatement projects at approximately the same date.

The Massachusetts approach to river basin plan preparation has developed from the series of reports on the water quality of the various basins. These reports began with the publication of data from water quality surveys and

analyses of waste discharges. These reports are known as Parts A and B for a particular basin. To make the engineering data from these reports meaningful to the general public, a third type of report, Part C, was developed to present a written and graphic analysis of the data, together with historical, hydrologic, and socio-economic information relating to water quality. Early reports of this type also proposed long-range solutions to water quality problems.

In the meantime, federal construction grants requirements were expanded to include the development of basin water quality management plans. Such plans were required for a particular basin in order for any abatement project in the basin to receive federal funding. Interim basin plans could be substituted as a transition measure until final basin plans were developed. The interim basin plans would cover a portion of the basin and utilize existing data. The Division developed numerous interim basin plans to support construction grants requests.

The Federal Water Pollution Control Act Amendments of 1972 (PL92-500) further established basin planning requirements. Subsequent guidelines promulgated by the U.S. Environmental Protection Agency provide a more detailed description of basin planning requirements and the role of the basin plan in relation to other planning efforts required under the federal law. While quite specific in terms of required content, the guidelines are still flexible enough to allow the states to tailor a particular basin plan to the needs of the subject basin. Severity and complexity of existing water quality problems, status of abatement programs, and availability of existing planning are factors affecting the scope of a particular basin plan.

A basin plan is a water quality oriented document based on the most up-to-date data available. The primary functions of a basin plan are:

1. To establish pollution abatement priorities in the basin based on existing water quality.
2. To establish schedules of compliance or target dates for abatement.
3. To establish effluent limitations for individual discharges necessary to meet water quality standards.
4. To identify and, where possible, establish controls for non-point pollution sources.
5. To identify further studies necessary to meet future water quality goals and establish the relationships among the various plans.
6. To evaluate and, where appropriate, propose changes in existing water quality standards.
7. To establish a program of water quality monitoring and surveillance to chart progress towards meeting the goals of the plan.

TABLE I-1

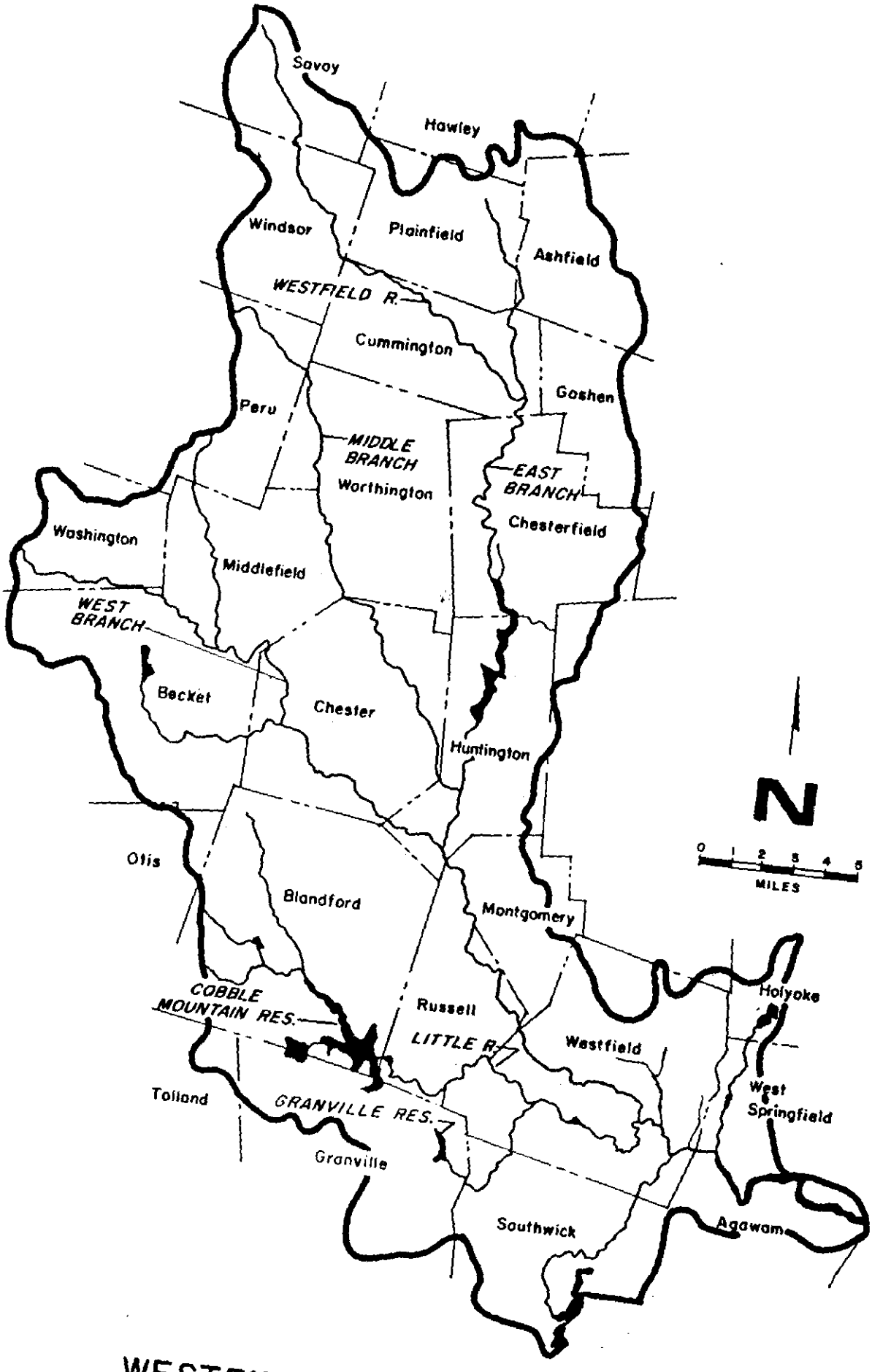
WESTFIELD RIVER BASIN CITIES AND TOWNS

LAND AREA - POPULATION

MUNICIPALITY	ESTABLISHED (year)	LAND AREA (sq. miles)	AREA IN BASIN (sq. miles)	POPULATION 1950	1960	1970
Agawam	1855	23.35	3.45	10,166	15,718	21,717
Ashfield	1765	40.28	16.08	977	1,131	1,247
Becket	1765	46.92	32.00	755	770	876**
Blandford	1741	52.70	49.80	597	636	863
Chester	1783	36.76	36.76	1,292	1,155	1,025
Chesterfield	1762	31.01	30.10	496	556	704
Cummington	1779	23.01	23.01	620	550	562
Goshen	1781	17.31	12.00	321	385	483
Granville	1754	43.20	18.00	740	874	984**
Huntington	1855	26.24	25.00	1,257	1,392	1,593
Middlefield	1783	24.13	24.13	295	315	288
Montgomery	1780	15.01	12.00	157	333	446
Peru	1771	26.05	11.00	143	197	256
Plainfield	1807	21.29	19.20	228	237	287
Russell	1792	17.71	17.71	1,298	1,366	1,382
Savoy	1797	36.03	10.50	291	277	322
Southwick	1770	31.15	24.00	2,855	5,139	6,330
Washington	1777	38.20	13.00	281	290	406
Westfield	1669	46.85	43.80	20,962	26,302	31,433
West Springfield	1774	16.75	9.45	20,438	24,924	28,461
Windsor	1771	35.13	16.50	372	384	468
Worthington	1768	32.04	32.04	462	597	712
Total			517.0*	65,003	83,528	106,845

*This also includes portions of Hawley, Holyoke, Otis, and Tolland.
**1965 data.

Source: 12



WESTFIELD RIVER BASIN

FIGURE 1 - B

II. WATER QUALITY STANDARDS

In 1967, the Massachusetts Water Quality Standards were adopted. These standards consist of three portions: definitions and regulations, classifications of the various waters, and the plans of implementation to achieve the desired use classifications.

The first portion, which includes definitions of the uses and criteria for each class, together with the General Rules and Regulations, was revised in May 1974. The revised rules and regulations are contained in Appendix 2 of this plan. The latter two portions are being reviewed and revised through this basin planning process. Application of the revised rules and regulations to each drainage basin amounts to a reclassification, even where existing classifications are not changed. The basin plan is considered to be the appropriate vehicle for this reclassification since it is based on a detailed water quality analysis. The basin plan also summarizes the abatement program for each of the discharges in the basin.

Of the new rules and regulations, perhaps the most significant is the anti-degradation provision. Under this provision, new discharges upstream of the most upstream existing municipal discharge are prohibited. No new discharge would be allowed to a stream that does not presently receive a municipal discharge. Under the definitions in this provision, "municipal discharge" refers to a municipal treatment plant or sewer but not to a storm drain. In the Westfield River Basin only the West Branch from the Town of Chester to its confluence, the main stem from the confluence of the West Branch to its mouth, and the Little River from the outlet of Cobble Mountain Reservoir to its confluence are not subject to this provision. No new discharges will be allowed into the other waters of the basin.

Numerical criteria for nutrients have been replaced by two general provisions. The first prohibits new discharges of nutrients to lakes or ponds; the second requires that any discharge containing nutrients in concentrations that would encourage eutrophication and the growth of algae and weeds shall be treated to remove the nutrients to the maximum extent technically feasible. This approach to the problem of nutrients allows for the fact that a given concentration of phosphorus or nitrogen will have a vastly different effect in different streams. In general, nutrients can be present in higher concentrations in free-flowing streams without causing algal blooms. The main stem of the Westfield River below the Town of Westfield is nutrient enriched owing to the sewage discharged by the town. This portion of the stream has been subject to algal blooms in the past that contributed to violations of water quality criteria. As abatement schedules proceed, this area will be monitored to determine the extent of eutrophication and the need for further treatment.

It should be noted that water quality standards do not apply to conditions brought about by natural causes. Silting caused by erosion and variations in total coliform densities and organic loadings caused by runoff do not,

by themselves, constitute violations of the standards.

The classification of the waters of the Westfield River Basin is summarized in Table II-1 and Figure II-A. The use classifications shown are the same as were assigned in 1967. Class A waters are "designated for use as sources of public water supply in accordance with the provisions of Chapter III of the General Laws." The Middle Branch of the Westfield River from its source to the outlet of Littleville Reservoir, the Little River from its source to the dam at Cobble Mountain Reservoir, and several other reservoirs in the basin are classified as A waters. Recreational uses of Class A waters are severely restricted by the General Laws.

Class B waters are suitable for water contact recreation, are an excellent fish and wildlife habitat, and are acceptable for public water supply after treatment and disinfection. The Federal Water Pollution Control Act Amendments of 1972 (PL92-500) establish 1983 as the date by which, "wherever attainable," water quality is to be suitable for recreational contact and for the protection and propagation of fish and wildlife. (This goal is referred to as "swimmable/fishable.") The remaining waters in the Westfield River Basin are classified B with the exception of one small section on the Little River from College Highway, Westfield, to its confluence with the Westfield River. This stretch of the Little River is classified C.

Class C waters are "suitable for recreational boating and secondary water contact recreation and for certain agricultural and industrial uses." Such waters are a suitable habitat for wildlife and fish indigenous to the region. The primary differences between Class B and Class C waters are lower dissolved oxygen and higher coliform bacteria levels in Class C. The C classification is assigned to a stream where treated effluents, combined sewer overflows, or urban runoff will cause such levels, even after normal abatement measures have been taken.

FUTURE WATER QUALITY GOALS

The Amendments of 1972 establish three milestone dates for water pollution control programs in the United States. By July 1977, all existing water quality classifications are to be met. By 1983, the swimmable/fishable goal is to be attained. By 1985, the national goal is the elimination of all discharges of pollutants. The 1977 objective is the basis for all ongoing abatement actions, while the 1983 and 1985 objectives are goals to be addressed in all water quality planning.

This plan is primarily concerned with the 1977 objective. The 1983 objective is taken to mean that all waters will be Class B or better. To meet the 1983 goal only one small section of the Little River need be upgraded from Class C to Class B. The 1985 goal has not yet been defined by EPA. It should be noted that the attainment of these two latter goals is not a legal requirement at the present time. However, it is a requirement that the 303(e) basin plan be developed in such a way as to ensure an orderly progression toward meeting these goals.

TABLE II-1

WESTFIELD RIVER BASIN CLASSIFICATION

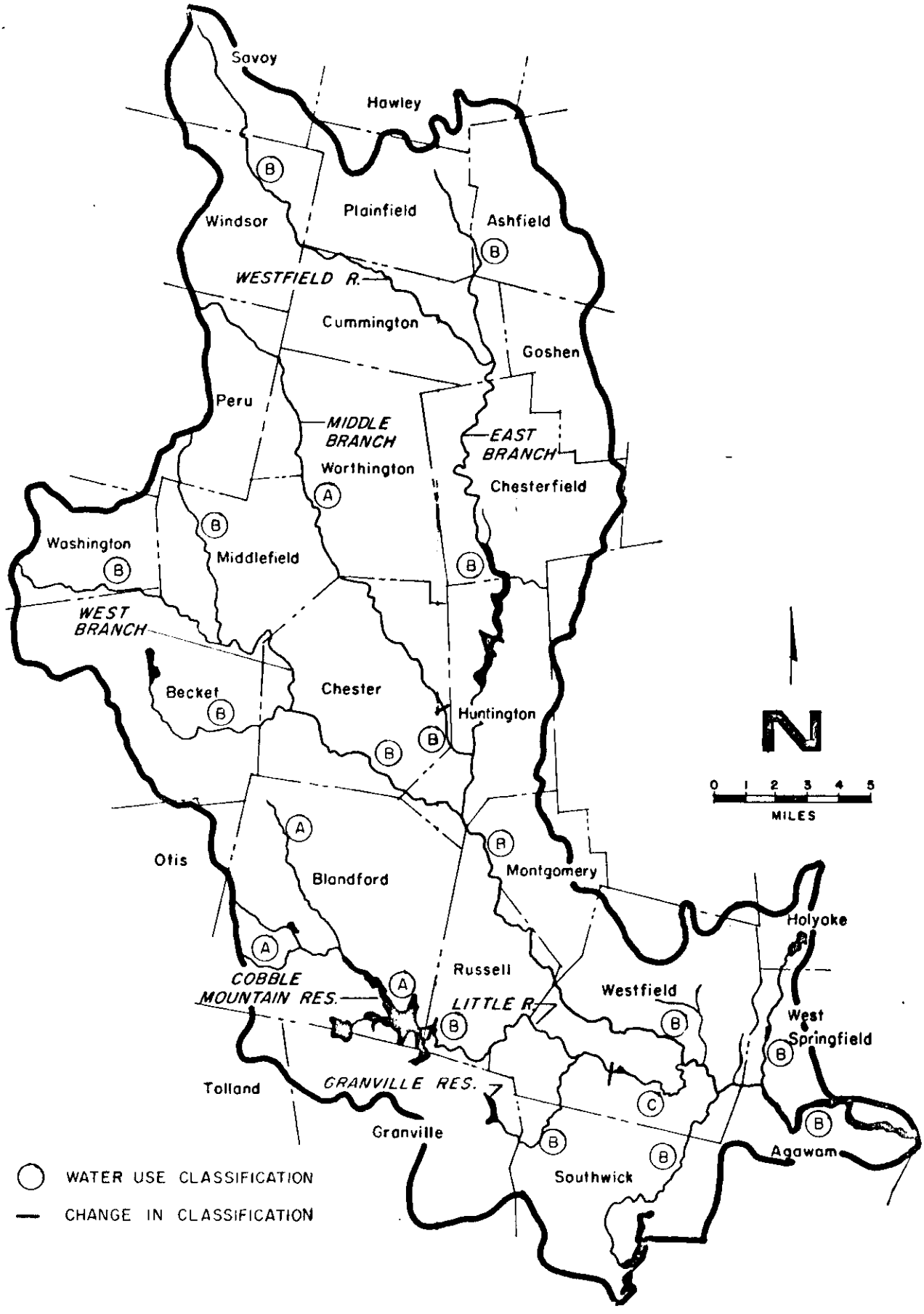
BOUNDARY	PRESENT USE	ANTICIPATED FUTURE USE	PRESENT CONDITION	CLASSIFICATION
West Branch of Westfield River from its source to Bancroft Road, Becket	Fish & wildlife propagation, fishing, industrial processing and cooling	Same	B	B
West Branch of Westfield River from Bancroft Road, Becket, to its confluence with Walker Brook, Chester	Fish & wildlife propagation, assimilation	Fish & wildlife propagation, fishing	C	B
West Branch of Westfield River from the confluence with Walker Brook, Chester, to confluence with the East Branch, Huntington	Fish & wildlife propagation	Same, fishing	C	B
Middle Branch of Westfield River from outlet of Littleville Reservoir, Chester, to confluence with East Branch, Huntington	Fish & wildlife propagation, fishing	Same	B	B
East Branch, Westfield River, from its source to confluence with Middle Branch, Huntington	Fish & wildlife propagation, fishing	Same, bathing	B	B
East Branch, Westfield River, from confluence of Middle and East Branches, Huntington, to confluence with West Branch, Huntington	Recreational boating, fish & wildlife propagation, fishing	Same	B	B
Westfield River from confluence of West and East Branches to Connecticut River, West Springfield	Recreational boating, fish & wildlife propagation, fishing, industrial processing and assimilation	Same	U & C	B

TABLE II-1 (Continued)

BOUNDARY	PRESENT USE	ANTICIPATED FUTURE USE	PRESENT CONDITION	CLASSIFICATION
Westfield Little River from its source to dam at Cobble Mountain Reservoir	Water supply	Same	A	A
Westfield Little River from dam at Cobble Mountain Reservoir to College Highway, Westfield	Fish & wildlife propagation, fishing	Same	B	B
Westfield Little River from College Highway, Westfield, to Westfield River, Westfield	Waste assimilation, irrigation	Fish & wildlife propagation, fishing, waste assimilation, irrigation	C	C
Long Pond to its outlet and tributaries thereto in Blandford	Water supply	Same	A	A
Black Brook Reservoir to its outlet and tributaries thereto in Russell	Water supply	Same	A	A
Montgomery Reservoir to its outlet and tributaries thereto in Montgomery	Water supply	Same	A	A
Granville Reservoir to its outlet and tributaries thereto in Granville and Tekoa Reservoir to its outlet and tributaries thereto in Westfield	Water supply	Same	A	A
Winchell Reservoir to its outlet and tributaries thereto in Granville	Water supply	Same	A	A

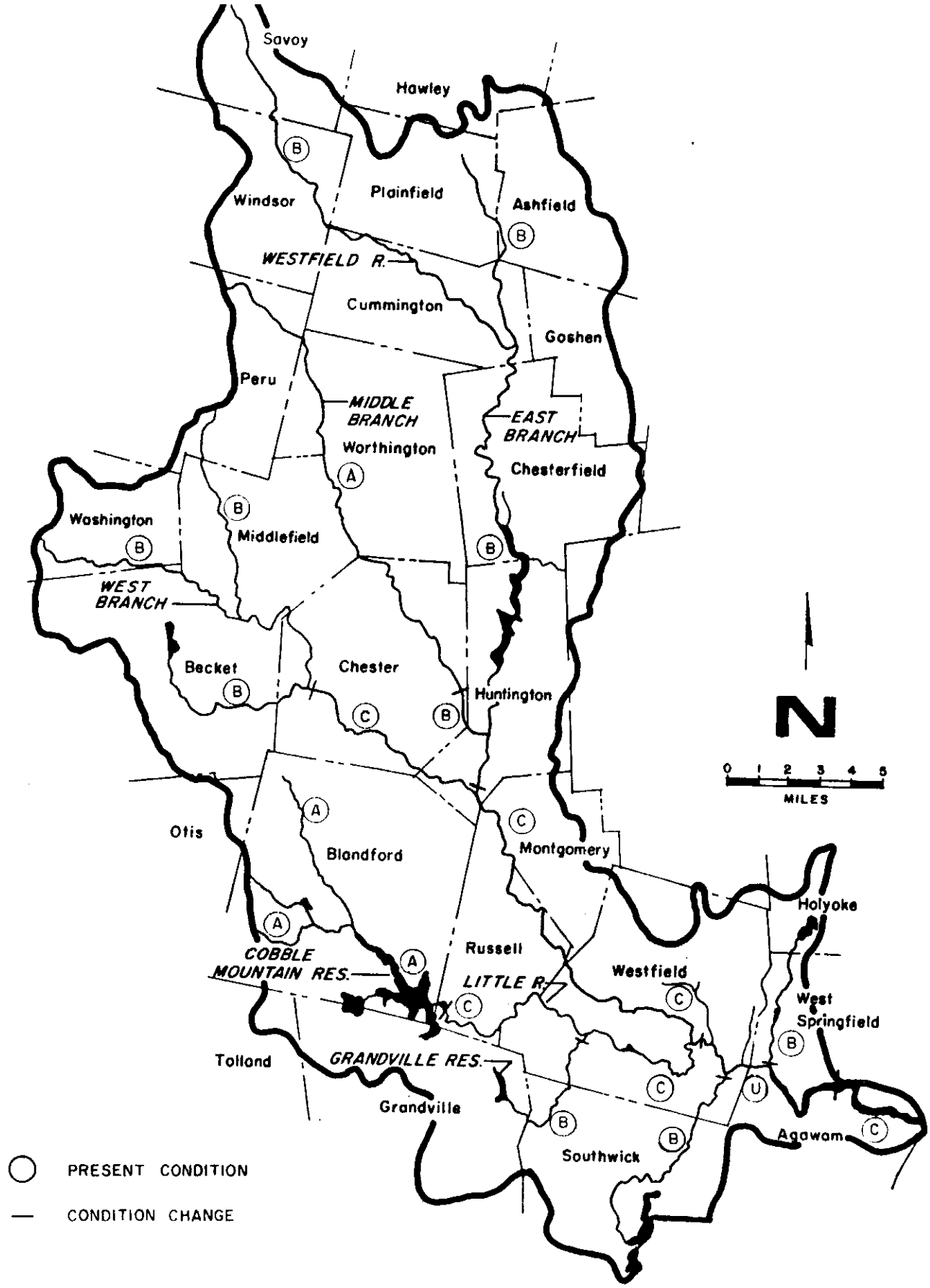
TABLE II-1 (Continued)

BOUNDARY	PRESENT USE	ANTICIPATED FUTURE USE	PRESENT CONDITION	CLASSIFICATION
Bear Hole Reservoir to its outlet and tributaries thereto in West Springfield	Water supply	Same	A	A
Middle Branch of Westfield River from its source to outlet of Littleville Reservoir, Chester, and tributaries thereto	Fish & wildlife propagation, fishing	Water supply	A	A
Other streams in the Westfield River Basin unless denoted above	---	---	--	B



CLASSIFICATION MAP

FIGURE II- A



PRESENT CONDITION

FIGURE II-B

III. EXISTING WATER QUALITY

BACKGROUND INFORMATION

Effective planning demands a sound data base. A clear understanding of existing water quality preceeds management methods and determines the plans for pollution abatement. Assessing the present condition of the Westfield River and its tributaries began with intensive instream and waste discharge sampling. These and other pertinent data were then compiled for analysis. From the findings, the causes of the present problems were determined.

Intensive instream sampling of the Westfield River Basin began in 1965. The main thrust of the effort was directed at the main stem of the Westfield River and the Little River. Chemical, biological, and hydraulic data were repeatedly gathered at key locations and used to develop a mathematical model of the river system. During this time, the Massachusetts Department of Public Health, the United States Environmental Protection Agency, and the Massachusetts Division of Water Pollution Control all contributed to the sampling effort. The most recent survey data were compiled and published by this Division in The Westfield River, Part A, 1972 and 1974 (Westborough, October 1974).

An inventory of the wastewater discharges in the basin started in 1971. The Division awarded a contract to Tighe and Bond, Inc., of Holyoke for the purpose of sampling all significant waste discharges in the Connecticut River Valley. Major discharges in the Westfield River Basin were included in this study, and the results were published in a report entitled Wastewater Discharge Survey, Connecticut River Basin 1972. The Division updated its information on recent discharge changes in the Westfield Basin in 1974.

Analysis of the river's present situation required a discussion of other related information including water use, basin history and economic background, population trends, and current plans and planning agencies. With this additional perspective, the present condition of the streams in the Westfield River Basin is described in The Westfield River, Part C, 1972 and 1974 (Westborough, May 1975).

All of the above-mentioned reports were submitted to the Environmental Protection Agency and are considered appendices to this plan.

SEGMENTATION

The degree of a particular water quality problem is determined by comparing present conditions to the stream's assigned use classification. Survey measurements of various parameters are compared to the specified criteria for the appropriate stream class. It is therefore necessary to treat waters with different classifications separately. Even when an entire river has the same classification, it is sometimes necessary to analyze certain sections separately because water quality conditions may change dramatically along the length of a river.

Due to these considerations, the waters of each basin are divided into segments. Each significant change in water quality along the course of a waterbody defines a new segment. Therefore, a segment is a portion of a waterbody with common water quality characteristics. Segments are reported as a length of river in linear miles.

In Table III-1, the streams of the Westfield River Basin are divided into twelve segments. The East Branch, the Middle Branch, the section of the main stem above the confluence with the West Branch, and the upper portion of the West Branch share common characteristics and are designated anti-degradation. They have been grouped together as one segment for simplicity's sake although they contain waters with use classifications of both A and B. Along the lower West Branch and main stem of the Westfield River, segment divisions occur at the point of introduction of each significant discharge or a number of closely grouped discharges. In addition, the lower main stem has a segment starting at the West Springfield Dam, for there is a considerable change in water quality at this point. The Little River is segmented where classification changes occur. Although the last five miles of this stream have several discharges, they are defined as one segment. The two most significant discharges in this segment are only about a mile apart at the top of the segment and are very similar in nature. The other discharges are grouped near the mouth of the Little River and their impact is on the main stem of the Westfield River. Other tributaries with discharges on them are assigned segments downstream of the discharge. Upstream portions of these tributaries along with the other streams of the Westfield Basin are designated anti-degradation, have a water use classification of B, and are not given segment numbers.

The segment class appearing next to the segment description in Table III-1 is a designation required by federal guidelines. It stipulates the pollution control measures required to meet water quality standards and thus permit the waterbody to attain its water use classification. An anti-degradation segment is one in which new discharges are prohibited. An effluent limited segment is where the application of "Best Practicable Treatment" (BPT) to each discharge will result in the attainment of water quality goals. Water quality limited segments are those in which higher degrees of treatment than BPT are required to meet existing standards. A "1" following the class indicates that standards are now being met; a "2" indicates that they are not being met.

The following is a discussion of each segment in the Westfield River Basin which points out specific violations of stream classifications and their causes.

Segment 0

The upper reaches of the Westfield River flow through mountainous terrain covered with a relatively thin layer of permeable soil. This allows extreme and frequent variations in flow due to runoff. Erosion due to runoff subjects the streams to heavy silt loads and fluctuations in coliform densities. Water quality standards do not apply to conditions brought about by natural causes. Therefore, this segment of the Westfield River

TABLE III-1

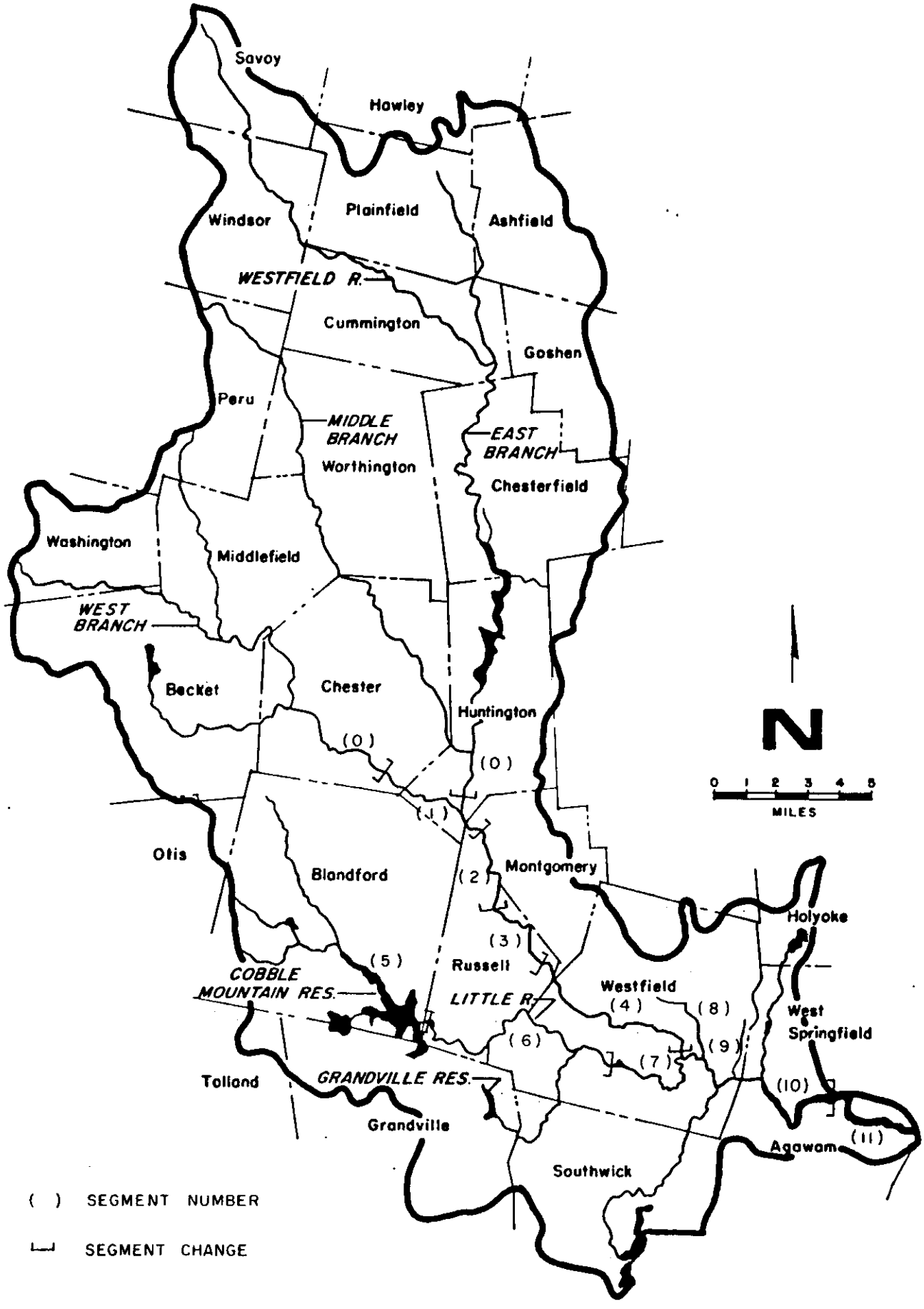
BASIN SEGMENTATION

WESTFIELD RIVER BASIN

SEGMENT NUMBER	STREAM	DESCRIPTION	MILE POINTS	SEGMENT CLASS	CLASSIFICATION	PRESENT CONDITION
0	Westfield River	Westfield River above the confluence of the West Branch and the West Branch above the Town of Chester	62.5 - 25.0 25.0 + 17.5 - 7.5	AD	A&B	A&B
1	Westfield River	Lower West Branch and the main stem to Crescent Mills Dam	25.0 + 7.5 - 0.0 25.0 - 24.0	EL-2	B	C
2	Westfield River	Crescent Mills Dam to Russell Falls Dam	24.0 - 21.1	EL-2	B	C
3	Westfield River	Russell Falls Dam to Woronoco Dam	21.1 - 18.5	EL-2	B	C
4	Westfield River	Woronoco Dam to Little River confluence	18.5 - 11.1	WQ-2	B	C
5	Little River	Source to Cobble Mountain Reservoir Dam	11.1 + above 13.0	AD	A	A
6	Little River	Cobble Mountain Reservoir Dam to Horton's Bridge	11.1 + 13.0 - 4.7	EL-2	B	C
7	Little River	Horton's Bridge to confluence with Westfield River	11.1 + 4.7 - 0.0	EL-1	C	C
8	Powdermill Brook	From mile point 2.6 to confluence with Westfield River	10.0 + 2.6 - 0.0	AD	B	B

TABLE III-1 (Continued)

SEGMENT NUMBER	STREAM	DESCRIPTION	MILE POINTS	SEGMENT CLASS	CLASSIFICATION	PRESENT CONDITION
9	Unnamed brook	From mile point 0.6 to confluence with the Westfield River	8.5 + 0.6 - 0.0	AD	B	B
10	Westfield River	From confluence of Little River to the West Springfield Dam	11.1 - 3.9	EL-2	B	U
11	Westfield River	West Springfield Dam to confluence with Connecticut River	3.9 - 0.0	EL-2	B	C



SEGMENTATION MAP

FIGURE III-A

does not violate its A and B classifications.

Segment 1

Along the lower West Branch and the main stem of the Westfield River to Crescent Mills, Class B coliform criteria are continually violated. High coliform densities are due to the discharge of raw sewage from the towns of Chester and Huntington. In addition, the discharge of untreated industrial wastewater from Bendix Abrasives constitutes a violation of Class B standards.

Segment 2

From the Crescent Mills Dam to the Russell Falls Dam, Class B coliform criteria continue to be violated owing to a carryover effect from Segment 1. Texon, Inc., a paper company, discharges at the top of this segment but treats its wastewater. However, discharge surveys indicate that this particular paper mill process produces high concentrations of zinc.

Segment 3

This segment receives the discharges of the Russell Sewage Treatment Plant and the Westfield River Paper Company. Coliform densities fall in this segment but still occasionally violate Class B criteria. Russell's small extended aeration plant has occasional problems with overloads caused by infiltration. Westfield River Paper Company treats its discharge prior to discharge to the river and has a lagoon system for shock loads and filter backwashing. During the 1974 water quality survey there was an occasional overflow from the lagoons to the river which caused a rise in nutrient and suspended solids levels in the impoundment above Woronoco.

Segment 4

Untreated industrial wastewater from Strathmore Paper Company and raw sewage from the mill houses pollute this segment. Solids, color, and total coliform densities violate Class B criteria and aesthetically degrade the river. During low flow conditions, dissolved oxygen criteria are violated in the upper portion of this segment. High reaeration rates allow oxygen values to recover quickly, however, and the present condition of the segment is C.

Segment 5

The waters of Cobble Mountain Reservoir are used for a public water supply. The reservoir and its feeder streams have a water use classification of A and are designated as an anti-degradation segment. The Division of Environmental Health monitors the water quality in this segment.

Segment 6

In this segment the backwash of the filters used for the public water supply is discharged to the Little River. This resulted in relatively high suspended solids values in the stream during the 1974 water quality survey. Flow regulation imparted by Cobble Mountain Reservoir can result in prolonged periods of low flow below the dam. Releases from the reservoir can

cause wide variations in stream temperatures and flow regimes during the course of a day. Class B coliform criteria are sometimes violated in this segment. This is probably due to non-point sources from pasture land that abuts the stream along this segment.

Segment 7

Violations of Class C criteria did not occur in this segment during the last water quality survey. Stevens Paper Mills discharges from two mills in this segment. The upper mill does not treat its wastewater. During the 1974 water quality survey, however, the mill was under greatly reduced production. Treatment will be provided at this mill. The wastewater from the lower mill is effectively treated. Toward the confluence of the Little and Westfield Rivers, Columbia Manufacturing Company discharges treated wastewater to the Little River. Three-tenths of a mile upstream from the confluence is the discharge of an untreated municipal combined sewer. The impact of this wastewater is exerted primarily on the main stem of the Westfield River.

Segment 8

Powdermill Brook receives the discharge from Sterling Radiator Company. No known violations of Class B criteria occur.

Segment 9

An unnamed brook carries the discharge from the Western Massachusetts Hospital to the Westfield River. This small discharge is treated, and no known violations of Class B criteria occur.

Segment 10

The combined effects of carryover from upstream discharges on the Westfield and Little Rivers along with untreated combined sewers in the Town of Westfield pollute this segment. Total coliform densities greatly exceed Class B criteria. During low flow conditions, the dissolved oxygen content of the stream is depleted. Survey results show that diurnal fluctuations caused by algae were partially responsible for this violation. Therefore, the nutrient fertilization of the stream must be considered a problem at this time. Floating solids and color also degrade the segment. Settled sludge rises to the surface throughout this segment as a result of anaerobic activity in the stream bed.

This segment is the focal point of the stream's oxygen demands because of its relatively low reaeration rates and the lenghthy time of travel. Because of the total number of violations and the general aesthetic degradation of the river, the present condition is unsatisfactory in this segment.

Segment 11

This last segment of the Westfield River has high solids, color, and nutrient levels due to carryover from Segment 10. However, higher reaeration rates

prevent violations of Class B dissolved oxygen criteria. High total coliform densities are the result of both carryover and non-point sources.

SEGMENT SEVERITY RATINGS

Water quality conditions in the various segments have been rated by comparing the following parameters to the appropriate criteria:

1. Coliform bacteria
2. Dissolved oxygen (D.O.) and biochemical oxygen demand (BOD)
3. pH, metals
4. Solids, color, turbidity
5. Algae, nutrients
6. Temperature
7. Other (oil, pesticides, etc.)

Violations of the criteria have been rated on a scale from 0 (no problem) to 3 (severe problem). These ratings are based on the results of the most recent water quality survey conducted in 1974. In addition, classification violations are rated by the difference between the present condition and the present water use classification, with one point given for each letter grade difference.

Table III-2 shows the results of this rating. In general, the main stem of the Westfield River is in continual violation of Class B criteria because of high total coliform densities. Otherwise, only the two segments receiving major untreated discharges, Segment 4 (below Woronoco) and Segment 10 (below the Town of Westfield) have severe water quality problems.

RANKING OF SIGNIFICANT DISCHARGES

Segmentation is based primarily on existing wastewater discharges. After noting the severity of water quality problems in each segment, the next step is to relate the severity points to their specific causes and thereby rank the various wastewater discharges. For this task, not only the severity of the violation but also the length of river affected must be considered. In segments with more than one discharge, the severity points must be related to the specific causes of the violations. Carryover effects from upstream discharges also receive a share of the segment point total. Total severity points for each discharge are then multiplied times river miles affected, producing a severity ranking for each discharge.

Table III-3 ranks the significant wastewater discharges in the Westfield Basin according to their effects on water quality. Of the 37 total severity points assessed various segments of the streams, 33 have been related to specific discharges and multiplied by river miles affected to place each discharge in perspective. It is immediately obvious that Strathmore Paper Company and the Westfield municipal sewage rank 1 and 2 respectively in terms of polluting the river. These are followed by the effects of the raw sewage from the towns of Chester and Huntington. It is difficult to separate the combined effects of these discharges, for they affect the same segments and the chemical constituents of each discharge are the same. If

TABLE III-2

SEGMENT SEVERITY POINTS

WESTFIELD RIVER BASIN

SEGMENT	RIVER MILES	COLIF.	D.O.	SOLIDS, COLOR	NUTRIENTS	pH, METALS	TEMP.	OTHER	CLASS. VIOLATION	TOTAL
0. Above mile point 25.0 and upper West Branch	62.5-25.0	0	0	0	0	0	0	0	0	0
1. Lower West Branch, main stem to Crescent Mills	7.5-0.0, 25.0-24.0	3	0	0	0	0	0	0	1	4
2. To Russell Falls	24.0-21.1	2	0	0	0	1	0	0	1	4
3. To Woronoco	21.1-18.5	1	0	1	0	0	0	0	1	3
4. To Little River	18.5-11.1	3	1	3	0	0	0	0	1	8
5. Above Cobble Mtn. Reservoir	above 13.0	0	0	0	0	0	0	0	0	0
6. To Horton's Bridge	13.0-4.7	1	0	1	0	0	0	0	1	3
7. To confluence	4.7-0.0	0	0	0	0	0	0	0	0	0
8. Powdermill Brook	2.6-0.0	0	0	0	0	0	0	0	0	0

TABLE III-2 (Continued)

SEGMENT	RIVER MILES	COLIF.	D.O.	SOLIDS, COLOR	NUTRIENTS	pH, METALS	TEMP.	OTHER	CLASS. VIOLATION	TOTAL
9. Unnamed brook	0.6-0.0	0	0	0	0	0	0	0	0	0
10. Little River to West Springfield Dam	11.1-3.9	3	1	3	1	0	0	0	2	10
11. West Springfield Dam to confluence	3.9-0.0	2	0	1	1	0	0	0	1	5

TABLE III-3

RANKING OF SIGNIFICANT WASTEWATER DISCHARGES

WESTFIELD RIVER BASIN

DISCHARGE	SEGMENTS AFFECTED	SEVERITY POINTS	RIVER MILES	TOTAL
1. Strathmore Paper Co.	4	6	7.4	44.4
	10	3	7.2	21.6
	11	1	3.9	3.9
				69.9
2. Westfield sewage	10	7	7.2	50.4
	11	2	3.9	7.8
				58.2
3. Chester and Huntington sewage	1	4	8.5	34.0
	2	3	2.9	8.7
	3	2	2.6	5.2
				47.9
(Chester)				(24)
(Huntington)				(24)
4. Town of Russell	4	2	7.4	14.8
5. Springfield water supply	6	1	8.3	8.3
6. Texon, Inc.	2	1	2.9	2.9
7. Westfield River Paper Co.	3	1	2.6	2.6

further discernment is needed, flow data should be collected and the severity points divided accordingly. For the time being, each town is given half of the total severity points. It is obvious from the magnitude of the numbers that nearly any weighting of the figures will not change these towns' ranking in relation to the other discharges to the river. Further analysis would be necessary only if a priority system were needed relating only to these two towns. Next in priority is the Town of Russell. Raw sewage from the Village of Woronoco contributes to violations in Class B coliform criteria in Segment 14.

Other water quality problems in the basin are relatively minor. Most involve small modifications needed to existing treatment systems. Texon, Inc., Westfield River Paper Company, and the Springfield Water Supply all need such modifications to prevent violations documented by the 1974 water quality survey.

Other discharges not listed did not violate water quality criteria during the 1974 survey. One of these, Bendix Abrasives, discharges untreated wastewater to the Westfield River and, therefore, constitutes a violation of water quality standards because it does not provide the minimum required treatment. It is ranked below the discharge with the lowest total severity points. In addition, Columbia Manufacturing, Sterling Radiator, the Western Massachusetts Hospital, Stevens Paper Mills, and the Town of Russell discharge treated effluents to the Westfield River and its tributaries. Discharge data from the sewage treatment facility in the Town of Russell indicate that it has intermittent problems with infiltration and provides a lesser degree of treatment during these periods.

The four remaining segment severity points, two in Segment 6 and two in Segment 11, are believed to be caused by non-point sources. In both cases, high coliform densities are the result of overland runoff. In Segment 6, the Little River is abutted by rural pastureland, while in Segment 11, the Westfield River flows through a densely populated urban section. Non-point sources of pollution will be discussed in Section V.

IV. PRESENT ABATEMENT PROGRAM

DISCHARGE PERMIT PROGRAM

In 1967, when the Division of Water Pollution Control was established, abatement schedules were sent to all known dischargers. All of the enforcement functions formerly carried out under these implementation schedules have been transferred to the joint federal-state discharge permit program. This program, formally known as the National Pollutant Discharge Elimination System (NPDES), establishes levels of effluent quality to be maintained at existing treatment facilities and sets forth implementation schedules for discharges which contribute to violations of water quality criteria. Discharge permits comprise one vehicle for implementation of water quality management plans. Whereas the basin plan is essentially a strategy document, each permit sets a formal implementation schedule for abatement action. Coordination of basin planning and permit issuance is, therefore, vital in order to assure effective abatement of pollution in each basin, as well as state-wide.

In order to facilitate the issuance of permits, preliminary basin plans have been prepared for several Massachusetts rivers. These documents contain ranking of significant discharges, preliminary load allocations, and abatement priorities based on water quality impact. Discharge permits have been drafted based on the information contained in the preliminary basin plans. These permits will be revised to reflect additional recommendations of the final basin plans, if necessary.

Each permit contains two portions: effluent limitations and schedules for corrective actions. The effluent limitations formally establish performance criteria for treatment facilities. Through these limits, the goals of the operation and maintenance program are set. Implementation schedules are included when existing levels of treatment are not adequate to meet water quality goals or where no treatment is being provided. In instances where point source discharges, consisting of facility bypasses, overflows from combined sewer systems, and/or sewer systems with excessive infiltration/inflow, will not be eliminated by the construction of a new waste treatment system, an additional report must be submitted by the permittee. This report, which is usually due within 18 months of the permit issuance date, must contain both short- and long-term abatement programs. Short-term measures require development of a program of system operation to optimize the full potential of the permittee's treatment facilities and sewerage system. The long-term program must be developed for the eventual elimination of these discharges. When the permittee's report has been submitted, the "second round" of permits will establish schedules for implementation of the recommendations as approved by the Division and EPA.

In cases where existing treatment facilities provide insufficient degrees of treatment to meet water quality goals, the effluent limitations portion of the permit requires that present performance levels be maintained while corrective action is undertaken. This assures that conditions do not worsen in the period leading up to and including construction of a new treatment facility.

THE ABATEMENT PLAN

Violations of water quality criteria in the Westfield River Basin stem mainly from point sources of pollution. The treatment or elimination of these discharges will lead to the attainment of the 1977 water quality goals. Figure IV-A locates the fourteen significant wastewater discharges to the Westfield River and its tributaries. Table IV-1 summarizes existing and proposed treatment of these discharges. The time schedule for implementing pollution abatement measures is given in Table IV-2. The effluent limitations required to meet water quality goals are listed in Table IV-3.

The following is a discussion of the discharges and their abatement needs.

The Town of Chester presently discharges untreated sewage to the lower West Branch of the Westfield River from three locations. The town's present permit authorizes these discharges until July 1, 1977. In the interim, the town is to submit a facilities plan including preliminary plans and engineering reports for the proposed method of elimination of sanitary connections to the storm drain system and treatment of sanitary wastes. Preliminary work has been slow because the town must consider regionalization with the Town of Huntington and the viability of including the discharges from Bendix Abrasives.

Bendix Abrasives discharges grinding wastes and sanitary wastes to the West Branch of the Westfield River just below Chester's municipal discharges. If agreements can be reached with the Town of Chester, at least the sanitary portion of the wastewater should be treated at the municipal facility when it is available. Otherwise the company will have to provide its own facility with best practicable treatment. A preliminary permit for the industry calls for obtaining a contract with the town by June 1, 1976, but this may be revised after the town's facilities plan has been completed.

The Town of Huntington presently discharges untreated sewage at three locations on the West Branch of the Westfield River near its confluence with the main stem and at one location on the main stem just above the confluence. The town has been issued a permit calling for the construction of a municipal treatment facility to be completed early in 1977.

Texon Inc. is a paper mill discharging to the main stem of the Westfield River in the Village of Crescent Mills a mile downstream of the West Branch confluence. The mill has recently completed construction of a treatment system that effectively treats BOD and suspended solids. Previously the effluent contained high concentrations of zinc. Because this metal has been known to have a toxic effect on fish and other wildlife, standards have been formulated for its discharge. The present system is capable of substantially decreasing the amount of zinc discharged. Further study is needed to determine if additional zinc removal is required.

The Westfield River Paper Company is located at Russell Falls, three miles downstream of Texon Inc. The company has had a lagoon system for several years and has recently installed polydisc filters for the treatment of its effluent. During the 1974 water quality survey there was an occasional small overflow from the lagoons. The facility for this industry is considered complete, but overflows from the lagoons must be eliminated in order for this

TABLE IV-1

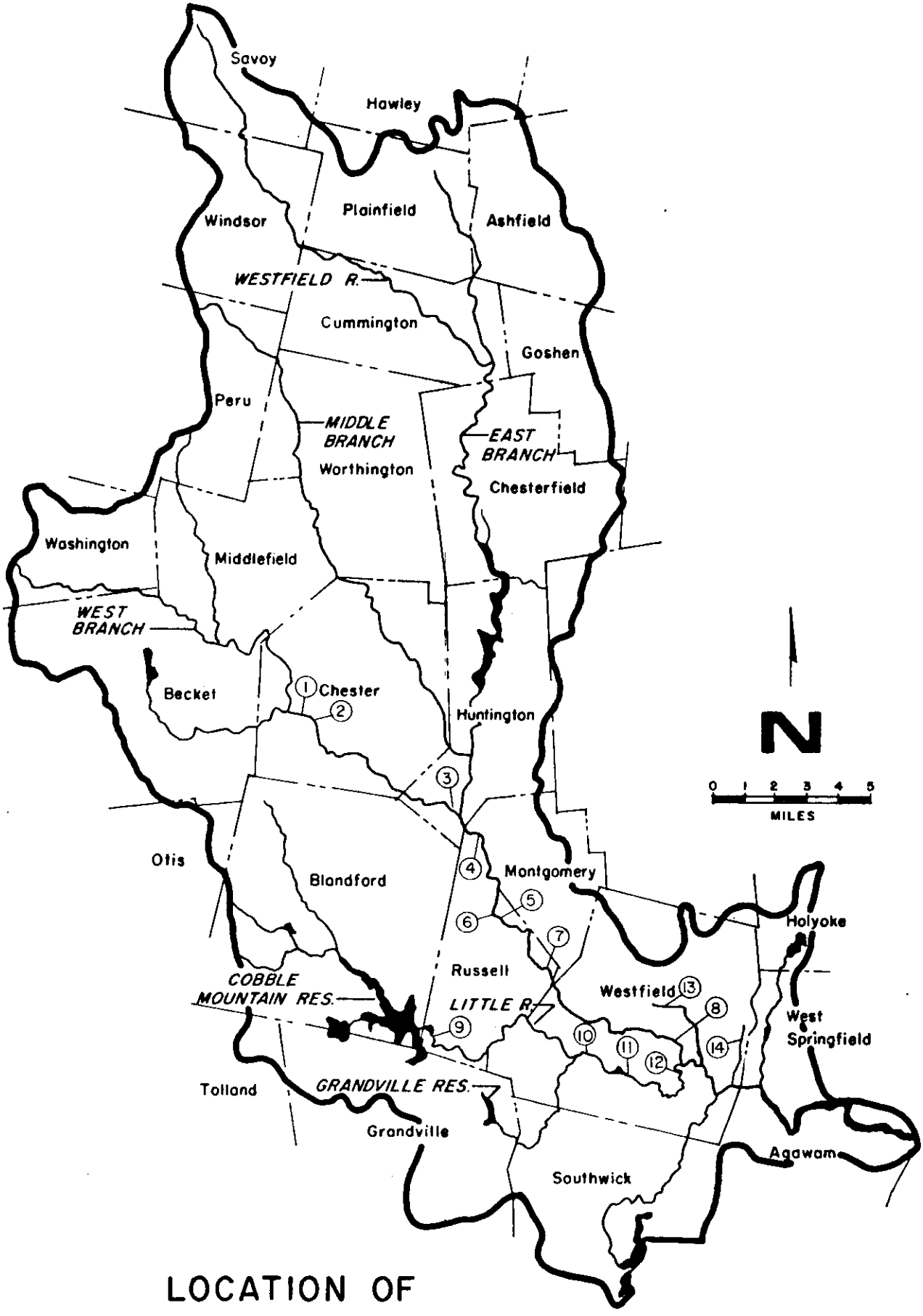
POINT SOURCE SUMMARY

WESTFIELD RIVER BASIN

DISCHARGE	RECEIVING WATER	TYPE	EXISTING TREATMENT	PROPOSED TREATMENT
1. Town of Chester	West Branch	Sewage	None	Secondary
2. Bendix Abrasives	West Branch	Grinding waste, sewage	None	BPT and sanitary connection to municipal facility
3. Town of Huntington	West Branch	Sewage	None	Secondary
4. Texon, Inc.	Main stem	Paper mill	Polydisc filters (BPT)	Same and zinc removal if necessary
5. Westfield River Paper Company	Main stem	Paper mill	Polydisc filters, lagoons (BPT)	Same and elimination of lagoon overflow
6. Town of Russell	Main stem	Sewage	Secondary	Same and extension of sewer system
7. Strathmore Paper Co.	Main stem	Paper mill, sewage	None	Settling and chemical coagulation (BPT), and low flow shutdowns
8. City of Westfield	Main stem	Sewage	Secondary	Same and extension of system to include present untreated discharges
9. Springfield Water Supply	Little River	Filter backwash	Lagoons	Same
10. Stevens Paper Mill (upper)	Little River	Paper co.	Facility under construction	BPT when it reopens

TABLE IV-1 (Continued)

DISCHARGE	RECEIVING WATER	TYPE	EXISTING TREATMENT	PROPOSED TREATMENT
11. Stevens Paper Mill (lower)	Little River	Paper co.	Polydisc filters (BPT)	Same
12. Columbia Manufacturing	Little River	Plating waste	Metals removal and pH control	Same
13. Sterling Radiator	Powder Mill Brook	Cooling water	Metals removal and pH control	Same
14. Western Massachusetts Hospital	Unnamed brook	Sewage	Primary, sand filters and chlorination	Same



LOCATION OF

WASTEWATER DISCHARGES

FIGURE IV-A

TABLE IV-2

ABATEMENT SCHEDULE

WESTFIELD RIVER BASIN

DISCHARGE	SUBMIT FACILITIES PLAN/ENGINEERING REPORT	SUBMIT FINAL PLANS	COMMENCE CONSTRUCTION	COMPLETE CONSTRUCTION	REMARKS
1. Town of Chester	9/1/76	---	---	---	
2. Bendix Abrasives	---	---	---	---	To obtain contract for joint treatment with Town of Chester by 6/1/76
3. Town of Huntington	9/1/75	9/1/76	6/1/77	---	
4. Texon, Inc.			Completed		Zinc removal by 1977 if required
5. Westfield River Paper Company			Completed		Cease overflow from lagoons by 1977
6. Town of Russell	12/31/75	12/31/76	6/30/77		Dates are for sewer extension
7. Strathmore Paper Co.	8/21/74	11/30/75	3/31/76	3/31/77	Must meet permit requirements by 6/30/77
8. City of Westfield			Completed		Submit facilities plan for sewerage extension by 1/1/76 and elimination of combined sewers
9. Springfield Water Supply			Completed		Permit being drafted

TABLE IV-2 (Continued)

DISCHARGE	SUBMIT FACILITIES PLAN/ENGINEERING REPORT	SUMMIT FINAL PLANS	COMMENCE CONSTRUCTION	COMPLETE CONSTRUCTION	REMARKS
10. Stevens Paper Mills (upper)			Under construction		Treatment system to be completed before mill reopens
11. Stevens Paper Mills (lower)			Completed		
12. Columbia Manufacturing			Completed		
13. Sterling Radiator			Completed		
14. Western Massachusetts Hospital			Completed		

TABLE IV-3

EFFLUENT LIMITATIONS

WESTFIELD RIVER BASIN

DISCHARGE	FLOW (MGD)	BOD_5	SUSP. SOLIDS	NUTRIENT REMOVAL	pH	TEMPERATURE	OTHER CONTROLS
1. Town of Chester	--	30 mg/1	30 mg/1	No	--	--	--
2. Bendix Abrasives	0.0075	--	30-60 mg/1	No	6.5-8.5	Max. 85°F	--
3. Town of Huntington	--	30 mg/1	30 mg/1	No	--	--	--
4. Texon, Inc.	0.5	110 lbs/ day	175 lbs/day	No	--	--	Zinc
5. Westfield River Paper Co.	1.5	125 lbs/ day	190 lbs/day	No	--	--	--
6. Town of Russell	0.20	30 mg/1	30 mg/1	No	--	--	--
7. Strathmore Paper Co.	4.15	724 lbs/ day	724 lbs/day	No	--	--	--
8. City of Westfield	4.00	30 mg/1	30 mg/1	No	--	--	--
9. Springfield Water Supply	--	--	--	No	--	--	--
10. Stevens Paper Mill (upper)	--	70 lbs/ day	50 lbs/day	No	--	--	--
11. Stevens Paper Mill (lower)	--	145 lbs/ day	110 lbs/day	No	--	--	--

TABLE IV-3 (Continued)

DISCHARGE	FLOW (MGD)	BOD_5	SUSP. SOLIDS	NUTRIENT REMOVAL	pH	TEMPERATURE	OTHER CONTROLS
12. Columbia Manufacturing	--	--	20 mg/l	No	6.0-8.5	--	Copper, zinc, cyanide, chromium, nickel
13. Sterling Radiator	--	--	30 mg/l	No	6.0-8.5	Max. 83°F	Iron, copper, oil and grease
14. Western Massachusetts Hospital	0.02	100 mg/l	60 mg/l	No	--	--	--

facility to fully meet water quality standards.

The Town of Russell has a small extended aeration treatment facility across the river from the Westfield River Paper Company. Discharge data on the effluent indicate that overloads caused by infiltration can reduce the efficiency of the facility. In addition, the sewer system needs expansion to include the villages of Crescent Mills and Woronoco. The permit for the Town of Russell authorizes this discharge until June 30, 1977, at which time the town should be ready to commence the necessary construction. In the meantime, the abatement schedule contains dates for the submission of engineering reports and facility plans.

Strathmore Paper Company discharges untreated paper process wastewater and sanitary waste to the Westfield River in the Village of Woronoco, about three miles downstream of Russell Falls. The large quantity of the whitewater discharge makes the segment below the mill water quality limited. Best practicable treatment would not meet water quality standards. Agreement was reached between the Division and the paper company for the construction of a treatment facility that would remove 88 percent of the BOD and 95 percent of the suspended solids from the mill's whitewater discharges. In addition, the company must reduce its treated loadings to the stream during specified low flow conditions. The abatement schedule has been drawn up and construction should be completed early in 1977. Sanitary wastes from Strathmore will be connected to the municipal facility when it becomes available.

The City of Westfield completed construction of a modern secondary treatment facility in 1972. Discharge survey data indicate that the treatment plant produces a satisfactory effluent. At present the sewer system has not been extended to include all of the city's discharges. Several combined sewers discharge untreated wastewater to the Little River near its mouth and the main stem just upstream of its confluence with the Little River. The city's permit calls for the submission of a preliminary engineering report for the removal of sanitary connections to these storm drains by January 1, 1976.

Nutrient enrichment of the Westfield River downstream of the City of Westfield discharges has resulted in algal blooms in the past. The algal growths in combination with heavy BOD loadings have contributed to violations in dissolved oxygen criteria in this segment. The treatment of existing raw discharges in Westfield and the treatment of Strathmore Paper Company's discharges will eliminate the heavy BOD loading in this segment. If algae remain a problem after the present abatement plans are carried out, nutrient removal at the City of Westfield's facilities will have to be considered.

The Springfield Water Supply discharges the backwash from its filters to the Little River just downstream of the Cobble Mountain Reservoir Dam. The discharge passes through two lagoons before it is received by the river. During periods of frequent backwashings and heavy rainfalls, the Little River has been subjected to high suspended solids loads from the effluent. A permit is currently being drafted for this discharge. Additional treatment may not be necessary since proper management of the present system (i.e., backwashing only one filter per day) has proved effective in producing a satisfactory effluent.

Stevens Paper Mills, Inc. operates two mills on the Little River. The upper mill is located approximately five miles upstream from the mouth of the Little River. This mill is currently closed, but before the shutdown a treatment system was under construction. The abatement plan requires the mill to complete this construction before re-opening.

The lower mill is located just over a mile downstream from the upper mill. Polydisc filters are used to treat its effluent to the Little River. The system operates effectively but the Division does have concern over batch dumps. This problem comes under the jurisdiction of the monitoring program discussed in Section IX.

Columbia Manufacturing Company discharges to the Little River about a mile upstream from its confluence with the Westfield River. Its permit sets effluent limits on the concentration of the metals in the plating wastewater and for the control of pH. The company presently has a treatment system which meets these requirements.

Sterling Radiator Company has a small discharge to Powder Mill Brook. Its permit sets effluent limits for suspended solids, iron, copper, oil and grease, pH, and temperature. The company currently has a treatment system that complies with these requirements.

The Western Massachusetts Hospital discharges to a small unnamed brook that enters the main stem of the Westfield River eight and one-half miles above its mouth. The wastewater undergoes primary treatment, is passed through sand filters, and is chlorinated before being discharged. The effluent meets permit requirements.

Substantial progress in pollution abatement has been accomplished in the Westfield River Basin in recent years. Of the 14 municipalities and industries having direct discharges to the Westfield River and its tributaries, nine have constructed treatment facilities. Of these, two municipalities (Russell and Westfield) need expansion of their present facilities; both should be well into the construction phase by 1977. Two paper mills--Texon Inc. and Westfield River Paper Company--need modifications of the use of their systems, but no further construction is anticipated. Of the five dischargers that do not have treatment facilities, Strathmore Paper Company and the Town of Huntington have schedules that will result in the construction of required treatment facilities early in 1977. Bendix Abrasives and the Town of Chester should resolve any problems of joint treatment by mid-1976 and start preparing final plans the same year. The fifth discharge without a treatment system is Stevens Paper Mills upper mill. This mill is currently closed; but a treatment system is under construction, and completion of the system is required before the mill reopens.

V. NON-POINT POLLUTION SOURCES

DEFINITION

The major efforts of pollution abatement have been directed towards discharges of sewage and industrial wastes. These wastewaters are usually discharged continuously through pipes. These sources are therefore readily located, quantified, and studied. Discharges to a watercourse that can be located at a defined point are referred to as "point sources" of pollution, and abatement proceeds through the permit program.

Those pollutants which reach a watercourse through means other than a pipe or conduit are from non-point sources of pollution. These include storm water runoff and leachate from subsurface disposal systems that eventually enter a watercourse over a given area rather than at a definite point. Some of the more common non-point sources of pollution are:

Urban runoff - Depending on the drainage area, storm runoff from urban areas may contain various types of pollutants such as chlorides and oil from streets and parking lots, nutrients from lawn fertilizers and car washes, silt and sand, coliform bacteria, and, in some cases, high levels of organic matter.

Agricultural runoff - Runoff from farms may include nutrients from fertilizers and pesticides and high densities of coliform bacteria and organics from animal wastes.

Dump leachate - The decomposition of solid wastes can contaminate groundwater. Leachate from dumps may include metals, BOD, coliform bacteria, and nutrients.

Land stripping - The primary effect of land stripping for construction or mining purposes is the discharge of large quantities of sediment. This may decrease the depth of a water body, alter stream hydraulics, reduce light penetration, and alter many natural stream processes. Removal of trees and other vegetation along a watercourse can increase siltation, change runoff patterns, and increase water temperature by eliminating the shade provided by trees.

Subsurface sewage disposal - Leachates from malfunctioning subsurface disposal systems can contaminate ground and surface waters. A secondary problem is the disposal of the septage, the material that is pumped out of septic tanks and cesspools. Unrestricted discharge of septage is a major operational problem at many sewage treatment plants. Septage is also disposed of illegally to storm sewers or watercourses in areas where no proper disposal sites are available.

Vessel wastes - Wastes from marine vessels are often discharged without treatment. This is a particularly acute problem in coastal streams where many large ships are congregated in a small area.

Oil - Intermittent spills from oil tankers and terminals are failry common.

Waste oil from garages and service stations can also be a problem. Oil and certain other hazardous substances demand unique solutions for they cannot be discharged to a sewer.

The technology for quantifying and analyzing non-point sources of pollution is in a developmental stage. As yet, the problem has not been taken up on a state-wide basis. Individual cases are presently being handled as they are identified. Survey procedures designed to isolate non-point sources are being developed and refined by this Division. Until such time as a survey of this kind is completed on the Westfield River, an accurate, quantitative assessment of this type of pollution is not possible.

INCIDENCE

In the Westfield River Basin specific violations of water quality criteria can largely be traced back to point sources of pollution. However, the 1974 water quality survey indicated two segments of the Westfield where non-point sources contributed to violations of criteria.

Segment 6 - During the 1974 survey a station was sampled above the Stevens Paper Mills upper mill. Coliform densities exceeded Class B criteria. Since the only upstream point discharge is the filter backwash of the Springfield water supply, which should not contain high coliform densities, it is assumed that the coliforms are from a non-point source. This is reasonable for this particular segment of the Little River is subject to erosion. The coliform test detects certain normal soil bacteria. In addition, there is pastureland abutting the stream in this segment, and the coliforms could be from animals grazing near the river.

Segment 11 - There are no point discharges to the Westfield River in this segment; yet in 1974, total coliform levels were higher here than in the segment immediately upstream. Because this portion of the Westfield flows through the urban area of Agawam and West Springfield, the rise in coliform densities is probably the result of urban runoff.

Effective means of dealing with these non-point sources of pollution will not be developed by 1977, but it is not anticipated that this will result in an impairment of water use in these segments.

Other evidences of non-point sources of pollution do not appear in water quality survey data. If they do exist, they are masked by the effect of the point sources. However, areas where non-point sources are a potential hazard can be identified.

The upper portion of the basin is largely rural and the majority of the population disposes of their wastes through individual subsurface disposal systems. It is the responsibility of the local boards of health to insure that the requirements of the State Sanitary Code are met.

Urban runoff is a potential hazard in the lower portion of the basin. These areas include the main stem from the City of Westfield to its mouth and the lower reaches of the Little River. Although the control of pollution associated with stormwater is beyond the scope of this report, it will be dealt with in other plans, such as 201 plans, which are required elsewhere in the planning process.

Agriculture occupies only about one percent of the basin's population and is on the decline. There are no known significant impacts on water quality in the basin owing to agricultural runoff.

Earlier in the basin's history, land stripping, a result of lumbering activities, contributed to erosion and silt loadings to the streams. Today, lumbering is no longer a predominant industry in the basin, and the percentage of forested land is increasing.

The problem of contamination from dump leachate will be intensified as present sites or new sites are used for the disposal of sludge from wastewater treatment plants. Proper location and operation of dump sites should be addressed in the Phase II Basin Plan which is scheduled for completion in 1978.

VI. WASTE LOAD ALLOCATIONS

INTRODUCTION

To eliminate violations in water quality standards, it is necessary to establish effluent limitations for individual discharges. Allowable waste loads are calculated for each segment. Those segments in which it is determined that higher degrees of treatment than BPT are necessary are designated water quality limited. In these segments the maximum daily allowable loading for the segment determines the degree of treatment required. Segments in which BPT will meet water quality standards are designated effluent limited segments. In these segments, BPT is determined by guidelines established by the EPA for each industry type.

APPLICATION OF THE MATHEMATICAL MODEL

The determination of waste load allocations involves complex biochemical reactions occurring in a stream. The behavior of organic wastes discharged to a watercourse is governed by stream chemistry, biology, and hydraulics. Pertinent data on all these aspects must be collected before a specific situation can be analyzed. Stream reactions can be altered by the overlapping effects of downstream discharges, making it impractical to study isolated situations and necessitating concurrent analysis of all the influencing factors. To deal with this complex situation, the Division of Water Pollution Control uses a computer model to simulate the combined effects of the various parameters that regulate the assimilative capacity of a stream.

The basin model employed by this Division for the analysis of rivers was developed under a research grant and is described in a publication entitled Systems Analysis for Water Pollution Control (Quirk, Lawler and Matusky Engineers, June 1971). Certain modifications to this basic model have since been made by Division personnel; these will be described in separate publications. The model consists of numerous equations which simulate physical, hydraulic, and biochemical reactions in a river. During water quality surveys, numerous parameters are measured and used as inputs to the computer so that the basic model can be applied to a specific situation.

For rivers such as the Westfield, in which water quality is affected mainly by organic loadings from point discharges, the water quality parameter modeled is dissolved oxygen (D.O.). A thorough understanding of all stream phenomena is required to accomplish this because D.O. is affected by numerous factors.

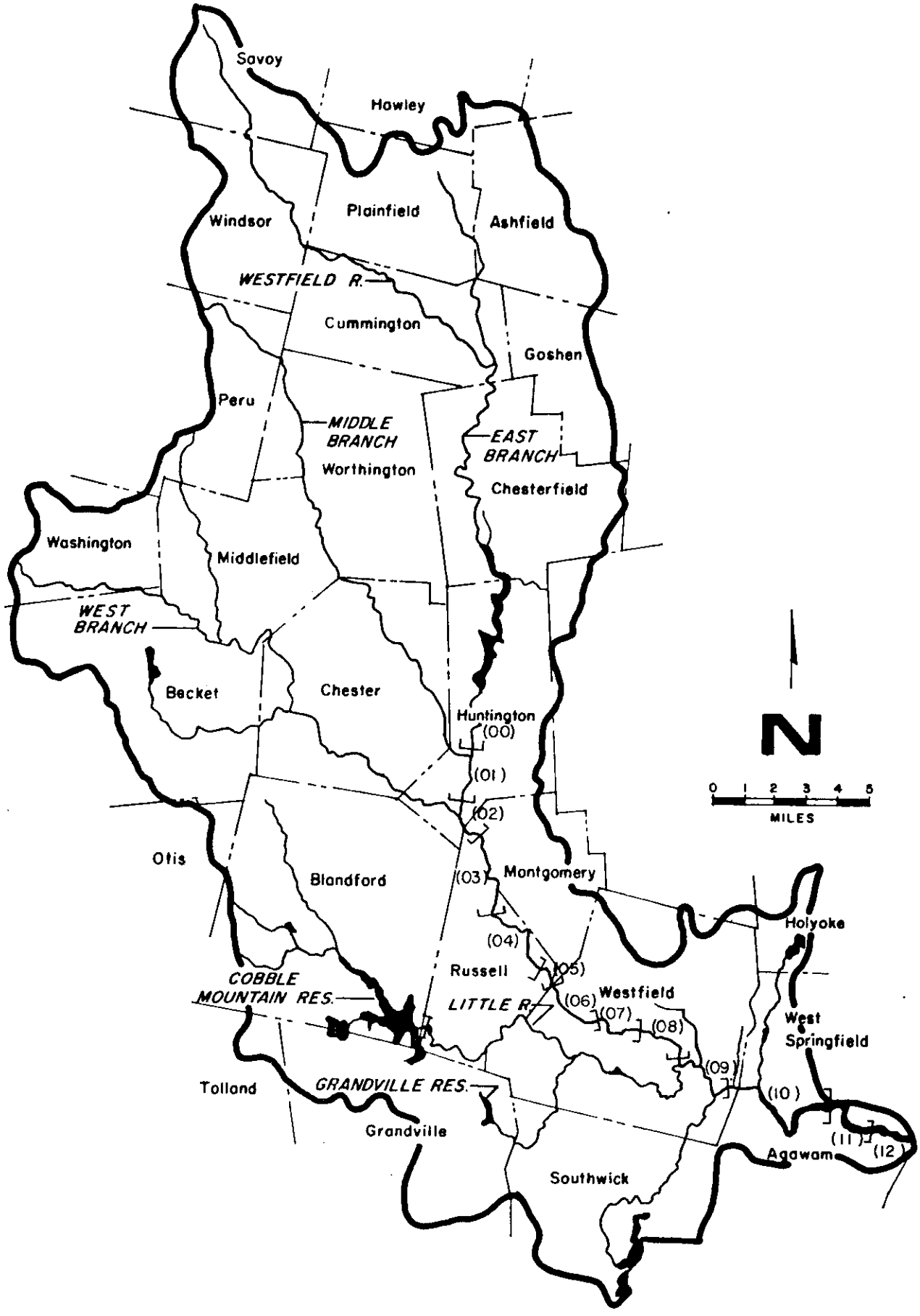
The modeling procedure starts by collecting data on all necessary parameters at numerous locations along a stream. The river is then divided into reaches, or lengths of river that can be defined by one set of parameters. These reach divisions occur at each waste discharge, tributary, impoundment, dam, and rapids section. Reach descriptions and physical parameters for the Westfield River Basin are listed in Table VI-1.

TABLE VI-1

WESTFIELD RIVER BASIN

DELINEATION OF MODELING REACHES

REACH CODE	RIVER MILES	DRAINAGE AREA (square miles)	DESCRIPTION
WF00	62.5 - 27.1	165.9	East Branch above confluence with Middle Branch
WF01	27.1 - 25.0	222.6	Main stem to West Branch confluence
WF02	25.0 - 24.0	324.1	To Crescent Mills Dam
WF03	24.0 - 21.1	338.8	To Russell Falls Dam
WF04	21.1 - 18.5	349.6	To Woronoco Dam
WF05	18.5 - 17.4	350.6	To Mass. Pike crossing
WF06	17.4 - 15.5	354.1	To W.Q. Station WF10
WF07	15.5 - 12.4	363.5	To North Elm Street
WF08	12.4 - 11.1	365.6	To Little River confluence
WF09	11.1 - 8.3	497.0	To U.S.G.S. gage
WF10	8.3 - 3.9	513.2	To West Springfield Dam
WF11	3.9 - 2.2	515.6	To Route 147
WF12	2.2 - 0.0	517.0	To Connecticut River



MODELING REACHES

FIGURE VI-A

After all the input parameters for each reach are defined, the model is used to simulate the D.O. levels observed during the water quality survey. When this is accomplished, the model is tested by using the same constants to simulate a second water quality survey. If this can be done satisfactorily, the model can be used to predict future conditions. Various degrees of treatment can be simulated at each waste discharge until the desired water quality is achieved. The amount of pollutants which can be discharged without impairing the desired water quality is thus determined and is known as the load allocation. These allocations are tested by further field work; for example, the predictions made regarding a proposed treatment facility are tested by performing another major water quality survey following the completion of that facility.

The mathematical model of the Westfield River is based on the data collected during the 1972 water quality survey. The model is now being tested on the basis of new data collected during the 1974 water quality survey. When this is accomplished, the model will be adjusted to reflect the conditions expected during the 7 day-10 year low flow in the Westfield River. This is the lowest flow that could be expected to occur for seven consecutive days during a period of ten years. The maximum assimilative capacity of the river during these flow conditions will be determined. Massachusetts law requires that treatment facilities be designed to meet water quality criteria during this flow condition.

Although not completed, the mathematical model of the Westfield River can be used to determine which segments of the river are water quality limited and which are effluent limited. It was determined that Segment 4 (below Strathmore Paper Company) was water quality limited and all others were effluent limited. A total maximum daily load was developed for Segment 4 through a series of unit response curves using the Streeter-Phelps equation. Under this procedure, a dissolved oxygen deficit curve is developed for each of a number of influencing factors, the sum of which determines the total deficit. A number of initial input parameters were used for those in the model which are not yet verified. All allowable loadings thus calculated were less than the loading that could be expected as a result of best practicable treatment. The Division ordered that a system providing best practicable treatment be in operation at the paper company by 1977. In addition, the permit stipulates that loadings to the river from this system must be curtailed during specified low flow conditions so that the discharge will not result in violations of water quality criteria.

VII. ASSESSMENT OF MUNICIPAL NEEDS

INTRODUCTION

In order to meet the goals of this basin plan, considerable investments in pollution abatement facilities will be required. Municipal facilities are of particular concern since their construction is financed primarily through state and federal grants. Planning requirements established by both state and federal laws seek to assure that construction grants will be invested in the most cost-effective manner.

The Municipal Needs Study was initiated by the EPA to estimate the nation-wide costs of meeting water quality goals. The study has been carried out through the various state water pollution control agencies. To determine the municipal needs of the Westfield River Basin, the various reports of regional planning commissions and consultants including sewer needs studies and water and sewer studies, as well as field information gathered by the personnel from the Western Regional Office of this Division, were used.

Table VII-1 gives cost estimates for accomplishing the proposed municipal abatement plan.

MUNICIPAL NEEDS

Chester - At present the Town of Chester has a small system of combined sewers extending through the developed southwestern part of town. This system discharges raw sewage into the West Branch of the Westfield River. The remainder of the town relies on individual on-lot sewage disposal systems. To abate the pollution to the river, the town needs to construct a small secondary treatment plant with additional collectors and interceptors. Infiltration problems in the present system must be eliminated. Plans for the facility should consider the inclusion of the discharge from Bendix Abrasives. At the present time, joint treatment appears cost effective, and the industry has shown a willingness to cooperate in such a venture.

Huntington - The present public sewer service in Huntington in confined to the Huntington Fire District franchise area around Huntington Center. The system is combined and discharges untreated sewage to the West and East Branches of the Westfield River. This plan calls for the construction of a small secondary sewage treatment facility in the southwest portion of the town along with new collectors and interceptors. Like the Town of Chester, the Town of Huntington's rural character and lack of industry have resulted in a slow rate of growth. It is expected that on-lot disposal systems will be adequate for the unsewered portions of these towns for the next 20 years.

Russell - There are three sewered sections in the Town of Russell. The Village of Crescent Mills is served by a small septic tank, Russell Center has a small extended aeration plant for the treatment of domestic wastes, and the Village of Woronoco discharges its domestic wastes untreated to the main stem of the Westfield River. The design capacity of the existing Russell facility is great enough to handle the loadings from Crescent

TABLE VII-1

MUNICIPAL FACILITIES NEEDS 1975

WESTFIELD RIVER BASIN

MUNICIPALITY	SECONDARY TREATMENT	INFILTRATION	NEW COLLECTORS	NEW INTERCEPTORS	OVERFLOW CORRECTION	TOTAL
Chester	275,000	115,000	545,000	458,000	0	1,393,000
Huntington	340,000	0	317,000	367,000	200,000	1,224,000
Russell						
Russell	70,000	0	277,000	72,000	0	419,000
Woronoco	110,000	0	1,150,000	0	0	1,260,000
Crescent Mills	65,000	0	0	94,000	0	159,000
Southwick	0	0	3,362,000	1,896,000	0	5,258,000
Westfield	0	150,000	4,600,000	2,664,000	0	7,414,000

Mills. Therefore, an interceptor should be constructed to transport these wastes to the existing treatment plant. However, in recent years there has been a considerable increase in flow at the treatment plant with no corresponding increase in sewer connections. Because of the age of the sewer system, the flow increase is probably due to infiltration. This problem must be addressed in the facility plan being prepared for the town. A separate treatment plant will be needed for the domestic wastes from the Village of Woronoco. Sewage from Strathmore Paper Company will be connected to this facility within 30 days of its availability. The design and site selection of the Woronoco facility should be done with foresight for there is no room for expansion at the present Russell Center facility to meet the long-range future needs of the town.

Westfield - The City of Westfield has a modern secondary treatment facility. However, the sewer system has some infiltration problems. In addition, millions must be spent on new collectors and interceptors to service developing areas of the community and to eliminate the present discharge of untreated sewage to the Westfield and Little Rivers. Sewer use ordinances in the city must be strictly enforced. Industrial plating wastes, currently not properly pretreated, can lessen the degree of treatment provided by the plant by disrupting biological reactions used in the treatment process. Steps must also be taken to eliminate the city's existing combined sewers.

Southwick - The Town of Southwick is growing rapidly. In particular, high density development is occurring near the Congamond Lakes area. A sewer system must be constructed for present on-lot disposal systems are becoming inadequate. Current planning indicates the most logical site for a treatment plant would be on Great Brook near the Southwick-Westfield border. Because this site is close to a proposed interceptor from the City of Westfield, this plan recommends that new collectors and interceptors be constructed in Southwick for an eventual tie-in with the Westfield interceptor for treatment at the Westfield STP. In this manner the town can take advantage of the greater assimilative capacity of the Westfield River and eliminate the possible need for costly advanced waste treatment.

Agawam and West Springfield - The municipalities of Agawam and West Springfield are sewered to a regional treatment facility on Bondi Island which discharges to the Connecticut River. Because the water quality problems of these municipalities affect the Connecticut River, their municipal needs are discussed in The Connecticut River Water Quality Management Plan published by this Division (Westborough, 1975).

Ashfield - Although a considerable portion of Ashfield lies in the Westfield River Basin, water pollution problems in the town are more closely linked to the Deerfield River Basin. Municipal needs for this town are discussed in the Deerfield River Basin Water Quality Management Plan (Westborough, 1975).

Blandford - The Town of Blandford disposes of its wastes by individual on-lot systems. There are no water quality problems in the town at present, and no need for public sewerage is foreseen for the next 20 years because of the town's stable population.

Granville - Present sewage disposal in Granville is entirely by on-lot systems. Currently the systems are adequate and there are no water quality problems. It is not anticipated that a sewer system will be needed for the next 20 years.

Becket, Chesterfield, Cummington, Goshen, Middlefield, Montgomery, Peru, Plainfield, Savoy, Washington, Windsor, Worthington - These are all small rural towns. No sewerage systems exist in these towns. All wastes are disposed of in individual septic systems. Several of these towns have local problems with malfunctioning septic systems. In general, however, these towns do not have serious water pollution problems leading to the degradation of the Westfield River and its tributaries. Therefore, it is expected that all of these towns will continue to dispose of wastes by treatment in individual septic systems for at least the next 20 years. Sewage systems will not be built in these towns during this time period.

The Western Regional Office of this Division, working with the local town health agents, will continue to locate and eliminate individual sources of water pollution in these towns. These include septic systems which are not operating properly and homes which have not yet installed septic systems.

A problem common to all these towns is the disposal of septage. Use of landfills for the disposal of septage should be prohibited because of the health hazard and the danger of surface and groundwater contamination. Because of this problem, septage is often disposed of at wastewater treatment facilities. If the facilities do not contain special units to handle this waste, the treatment process can be upset due to the shock-loading of this high-strength septage waste. All treatment facilities being constructed which will have a design flow of less than 5.0 MGD or which will be serving a community which will continue to have a substantial portion of its population being served by septic systems will be required to include septage-handling facilities. The Division has established guidelines for the design of these facilities.

Population growth in the upper basin has been slow because of the rugged terrain and lack of industry. This trend is expected to continue. Future population growth is likely to be heaviest near the lakes in the region. These areas will probably be the first to require sewer systems.

VIII. RELATIONSHIP WITH OTHER PLANS

In formulating water quality management plans, numerous types of plans are taken into consideration. Future demands on water supply and water-related recreation must be met. Land use plans assist in determining future waste treatment facility needs. To date, the major thrust of this type of planning can be found in interim basin plans, regional planning agency water and sewer studies, and municipal facilities plans. Transportation plans and solid waste plans must also be considered for their impact on water quality. The basin planning process must consider and integrate these planning efforts into a water quality management plan that will attempt to satisfy the goals of all the planning processes.

INTERIM BASIN PLANS

In order to meet the requirements of 18CFR601 (Construction Grant Regulations) that a basin plan be written before a federal construction grant could be given, the Division prepared interim basin plans in lieu of formal basin plans, as provided for in the regulations. These were prepared for a number of the basins in the Commonwealth but not in the Westfield River Basin because the proposed municipal facilities had been planned previous to this requirement. The most recent progress in pollution abatement in the basin has concerned industrial facilities, which do not receive federal grants. Future municipal construction will fall under the jurisdiction of this basin plan, so interim basin plans will not be necessary for the Westfield River Basin.

REGIONAL PLANS

The Westfield River Basin is located within the areas of jurisdiction of three regional planning commissions. Peripheral towns in the upper northern and western parts of the basin are covered by the Berkshire County Reginal Planning Commission (BCRPC) and the Franklin County Department of Planning (FCDP). The main body of the basin is within the area of the Lower Pioneer Valley Regional Planning Commission (LPVRPC).

The BCRPC contracted with the engineering firm of Curran Associates, Inc., to develop a water supply and sewerage study for the entire Berkshire County. This project was completed in two stages. The first stage dealt with an inventory of future needs of the basin, while the second stage dealt with the proposed regional plan.

The FCDP, although a relatively small commission, is still active in planning activities in Franklin County. This agency is currently preparing several studies which will affect the Upper Westfield Basin. The FCDP has worked with several of its member towns to set up effective land use management programs. Guidance on sound water pollution abatement programs has been given to local towns which have requested it. The FCDP also functions as an A95 review group and has reviewed several proposed projects in this capacity.

The FCDP has not prepared water and sewage studies for the communities in Franklin County. This basin plan is, therefore, the first regional abate-

ment plan prepared for the Franklin County towns that are located in the Westfield River Basin.

The LPVRPC has a large staff and is involved in several studies within the Westfield River Basin. A Sewage Disposal Facilities report and a companion report on Water Supply Facilities were completed in 1970. Water Supply and Sewerage: 13 Communities was completed in 1971. This report covered the additional towns in this commission's district which were not dealt with in the initial report. These reports present long-term proposals for sewage disposal and water supply sources for the towns in the LPVRPC.

The LPVRPC is an active participant in the ongoing programs which were recommended by the New England River Basins Commission (NERBC) 1980 Connecticut River Basin Plan. This plan covers all the major tributaries to the Connecticut River including the Westfield River. The LPVRPC is providing information and review for a study on flood plain management which was recommended in that report.

Much of the long-range planning for the Westfield River Basin is being done as part of the planning for the entire Connecticut River Basin. Other projects which are currently underway which will affect water quality in the Connecticut River Basin include an in-depth study of the use of recycling to aid in the disposal of solid wastes and a large-scale study of mass transit needs for the region over the next five years. A related contract with the Massachusetts Department of Public Works calls for a major study of highway transportation in the region along with related facets such as scenic easements, bike paths, street extensions, and priorities for state-funded road, rail, and airport construction.

In addition to these specific studies, the LPVRPC staff is also available to assist member towns and cities with their local planning problems. These include zoning, master plans, sewer plans, or any other type of local situation which would require planning input.

The LPVRPC has reviewed a number of plans in its capacity as an A95 review group. The commission reviews these paans and proposals to determine their compatibility with the regional plans that have been developed by the LPVRPC.

OTHER PLANNING ACTIVITIES

The New England River Basins Commission (NERBC) published the 1980 Connecticut River Basin Plan on January 1, 1972. The report was completed by a joint federal-state coordinating committee chaired by the New England Division of the U.S. Army Corps of Engineers. This major report covered the entire Connecticut River Basin and contained information and recommendations relative to a number of areas. Some of these were wastewater management, flood control, land acquisition, resources planning and management, water supply, recreation, and additional studies needed. The most important of the additional studies recommended was that further study of flood control alternatives be carried out. This study will be discussed below. At the present time, the NERBC is not conducting any studies in the

Connecticut River Basin other than this study of flood control alternatives. The results of this study as well as other pertinent sections of the NERBC 1980 basin plan are compatible with this basin plan.

The Corps of Engineers has been active in the Connecticut Basin for many years. Formerly this was mostly structural, leading to the construction of dams, levees, and flood walls. These efforts resulted in the construction of the Littleville and Knightville Dams in the Westfield River Basin. The NERBC 1980 basin plan recommended that further plans for use of structural flood control measures be fully studied prior to their implementation. The Corps is now carrying out this study and will submit a report in 1975. The study will develop the data necessary for use in making decisions on flood control alternatives and will then use these data to examine structural and non-structural flood management alternatives in the Connecticut Basin. The Corps completed a reconnaissance study on the Congamond Lakes in Southwick to determine flood control measures, and a similar study in the City of Westfield is still in progress. A study is currently underway to determine the feasibility of utilizing the Knightville Dam in Huntington for the purposes of water-based recreation. The Corps is also doing some work on the HUD Flood Insurance Program. This involves mapping and other information to be used for flood plain management. West Springfield is one of the municipalities included in this study.

In addition to the work done by the Corps of Engineers, the United States Department of Agriculture, Soil Conservation Service, has done extensive studies on the West Branch of the Westfield River to locate potential multi-purpose reservoir sites. In these studies, cost of construction is weighed against the benefits to be gained from flow augmentation, flood control, and additional recreation sites.

PLANNING AREA DESIGNATION

Water quality management plans (Section 303e plans) are one of three types of plans provided for in the 1972 Amendments to the Federal Clean Waters Act. The other two types of plans are Facilities Plans (Section 201 plans) and Areawide Waste Treatment Management Plans (Section 208 plans).

Facilities plans are prepared for each municipality by consulting engineers. These plans are similar to the engineering reports of the past but are broader in scope. Along with basin plans, 201 plans are necessary in order for a town to receive a federal construction grant.

The towns in the Westfield River Basin currently required to submit facilities plans are pointed out in Section IV. Section VII points out areas that will need facilities plans in the future. These sections also discuss what these plans will have to cover for the individual towns affected.

The intent of areawide waste treatment management plans is to provide a mechanism for effective implementation of planned abatement measures in complex situations including numerous point and non-point source pollution control problems. These planning areas are designated by the Governor. At the present time, problems of this nature exist in the lower Connecticut Basin.

An initial attempt to get this area (which includes several towns in the lower portion of the Westfield River Basin) designated as a 208 area have not been successful. At this time, however, the area is still under consideration for a 208 designation.

IX. MONITORING PROGRAM

GENERAL

Documentation of the progress made towards meeting water quality goals through the implementation of this basin plan will be achieved by the water quality monitoring program of the Division of Water Pollution Control. This program has evolved from several directions. The Massachusetts Clean Waters Act, which established the Division in 1967, sets forth the duties to be performed by the Division. One of these is "to examine periodically the water quality of the various coastal waters and rivers, streams, lakes and ponds of the Commonwealth and publish the findings." Sampling of waste treatment facilities is an integral part of the Operation and Maintenance Program for municipal facilities. The sampling of all waste discharges is necessary in the analysis of receiving water data.

The 1972 amendments to the Federal Clean Waters Act (PL92-500) require that each state establish a coordinated, comprehensive water quality monitoring program. The program should contain seven elements:

1. Intensive water quality surveys
2. Biological monitoring
3. Water quality monitoring network
4. National Water Quality Surveillance Sampling Network
5. Lake monitoring
6. Compliance monitoring
7. Groundwater monitoring

With certain adjustments to ongoing programs, the Division is able to comply with the federal requirements. The state-wide program for each element is as follows:

Intensive water quality surveys - Such surveys have been performed on the major basins in the Commonwealth at intervals ranging from three to ten years, depending on pollution abatement progress. It is now the goal of the Division to survey each river basin and major estuary and harbor intensively at least every five years. At least one station in each segment will be sampled for two 24-hour periods during each of two weeks. All samples will be analyzed for dissolved oxygen, temperature, Biochemical Oxygen Demand, pH, total alkalinity, suspended solids, ammonia-nitrogen, nitrate-nitrogen, total phosphorus, chlorophyll a, total coliform bacteria, and microanalysis. Additional tests for particular constituents (oil and grease, heavy metals, pesticides, etc.) will be performed where appropriate.

Biological monitoring - This program was established in Massachusetts in 1973. It is the goal of the Division to conduct biological studies on all major basins in the Commonwealth in accordance with EPA rules and regulations on a five year basis.

Water quality monitoring network - This network consists of automatic monitors which provide continuous records of dissolved oxygen, temperature, pH, and specific conductance. Nine such monitors are operated jointly by the Division and the United States Geological Survey. Data from these monitors is published annually by USGS in Water Resources Data for Massachusetts, New Hampshire, Rhode Island, and Vermont.

National Water Quality Surveillance Sampling Network - This program was established in Massachusetts in the summer of 1974. Nine stations across the state are sampled monthly and analyzed for dissolved oxygen, temperature, chemical oxygen demand, pH, chlorophyll a, suspended solids, total solids, oil and grease, nitrogen series (total Kjeldahl, ammonia, nitrite, nitrate), total phosphorus, total and fecal coliform bacteria, radiochemical, specific conductance, and turbidity. Additional tests are run on water and sediment samples on a quarterly basis.

Lake monitoring - The first year-round intensive lake study by the Division was conducted in 1971. The program has been expanded to cover five lakes deemed critical (due to intensity of use or existing water quality problems) each year. These lakes will be sampled once each month for the year of study. The studies will cover lake geometry, hydrology, water quality, aquatic vegetation, lake inputs (feeder streams), and special studies. Additional lakes and ponds will be covered by baseline surveys. In most cases, four such surveys will be performed in conjunction with each week of intensive basin water quality surveys.

Compliance monitoring - Monitoring of waste discharges is now required by law to assure compliance with the terms of discharge permits. This will be coordinated with the sampling of treatment facilities for operation and maintenance purposes and the discharge sampling required for mathematical modelling. All major and ten to twenty percent of the minor municipal and industrial discharges will be sampled each year. Discharge samples will range from 24-hour composites on major municipal facilities to grab samples on some minor industrial discharges. The parameters for analysis on each sample will depend on the nature of the discharge and the terms of the discharge permit.

Groundwater monitoring - This program will be established in conjunction with other appropriate agencies in accordance with EPA rules and regulations.

In addition to the seven major areas, certain special studies will be conducted to evaluate particular problems. A phosphorus monitoring program to evaluate the impact of phosphorus removal at municipal treatment facilities on receiving waters is one such study being planned. Special studies will also be undertaken to evaluate the impact of non-point sources, combined sewer overflows, and urban runoff. Field studies for mathematical modelling needs, such as flow and time of travel studies, will continue to be performed.

WESTFIELD RIVER MONITORING PROGRAM

A monitoring program has been established for the Westfield River Basin which is in accordance with the plan for the rest of the state. This section details each of the seven monitoring programs listed above as applied to the Westfield River Basin.

Intensive water quality surveys - The Westfield River Basin was last sampled intensively in 1974. At that time, sixteen stations were sampled on the main stem and the Little River. These stations are located in Figure IX-A and defined in Table IX-1. The next intensive survey on the Westfield River Basin is scheduled for the summer of 1978. By that time several new treatment systems will be completed and it is expected that a significant improvement in water quality will be found.

TABLE IX-1

WESTFIELD RIVER SURVEY 1974

LOCATION OF SAMPLING STATIONS

STATION NUMBER	LOCATION	RIVER MILE
WF06A	Just below the confluence of West and Main Branches	24.9
WF07A	Below Texon, Inc., off Route 20	23.5
WF07	Carington Road bridge, Russell	21.3
WF08	Just below Westfield River Paper Company	20.9
WF08A	Above Strathmore Paper Company	18.5
WF09	Route 20 picnic area below Massachusetts Pike	17.2
WF10	Across from Juniper Park, Route 20	15.5
WF11	Route 202 bridge, Westfield	12.3
WF12	Hortons Bridge, Westfield Little River	11.0 + 4.7
WFL13	Route 202 bridge, Westfield Little River	11.0 + 2.0
WFL15	Route 20 bridge near confluence, Westfield Little River	11.0 + 0.1
WF17	Frog Hole, Route 20	9.9
WF17A	Robinson State Park	7.5
WF17B	Route 147 bridge, West Springfield	2.2
WF18	Route 5 bridge, West Springfield	0.4


WESTFIELD RIVER
SAVOY
HAWLEY
PLAINFIELD
ASHFIELD
WINDSOR
CUMMINGTON
GOSHEN
EAST BRANCH WESTFIELD RIVER
PERU
MIDDLE BRANCH WESTFIELD RIVER
WORTHINGTON
CHESTERFIELD
0 1 2 3 4 5
MILES
WASHINGTON
MIDDLEFIELD
BECKET
CHESTER
HUNTINGTON
WEST BRANCH WESTFIELD RIVER
OTIS
6A
MONTGOMERY
BLANDFORD
7A
7
WESTFIELD RIVER
HOLYOKE
8
8A
9
WESTFIELD
RUSSELL
10
11
WEST SPRINGFIELD
15
17
17A
18
TOLLAND
GRANVILLE
LITTLE RIVER
12
13
14
AGAWAM
17B
SOUTHWICK
CONNECTICUTT RIVER
LOCATION OF—
SAMPLING STATIONS

FIGURE IX-A

Recent surveys have been aimed at providing additional data for the mathematical model. Future surveys will include additional sampling stations on the West Branch of the Westfield River and possibly the Little River to further assess water quality conditions and expand the model to include these important tributaries.

Biological monitoring - In the past few years, the Division's biological monitoring section has undergone expansion and formulated new methodologies. A biological survey of the Westfield River Basin is scheduled for the summer of 1976. Station selection will focus on areas where metals and temperature may affect stream biota.

Water quality monitoring network - A four-parameter automatic monitor is located 3.5 miles upstream of the mouth of the Westfield River. This monitor provides a continuous record of the quality of the Westfield River before it enters the Connecticut River.

National Water Quality Surveillance Sampling Network - No stations from this network are located in the Westfield River Basin, nor are any planned in the immediate future. At some point in the future it would be desireable to establish a station at the USGS gaging station downstream of the City of Westfield and just upstream of Robinson State Park. Such a station would be located in the most critical reach of the Westfield River and would help determine future abatement needs.

Lake monitoring - Baseline studies have not been conducted on any lakes in the Westfield River Basin. There is relatively little standing water in the basin. Many lakes and reservoirs are used for water supply purposes; therefore, their recreational uses are restricted. However, several planning efforts call for expanded use of the reservoirs created by the Knightville and Littleville Dams. Studies are planned on these facilities in conjunction with the 1978 water quality survey.

Compliance monitoring - Major waste discharges in the Westfield River Basin were sampled in 1971-72 as part of an inventory of discharges to the Connecticut River and its tributaries. Information on significant discharges was updated during the 1974 water quality survey, and the results were published in The Westfield River Part C, an appendix to this plan. Additional sampling of waste discharges in the basin is slated for yearly updating.

Groundwater monitoring - Initially, this effort will consist of coordinating all such monitoring being conducted by various agencies. All public water supplies are sampled regularly by the Division of Environmental Health. Since many towns in the basin rely on groundwater supplies, this sampling comprises an important part of the monitoring program. Leachate monitoring should be conducted at all sanitary landfills and major subsurface waste disposal facilities. Sampling should be conducted by the particular town or industry operating the facility.

Special studies - In addition to these seven major areas, certain special

studies will be conducted to evaluate particular problems. If it is determined that phosphorus removal is necessary at the Westfield Sewage Treatment Plant, a special phosphorus monitoring program will be employed to evaluate the impact of the removal. In addition, field studies for mathematical modelling needs, such as flow and time of travel studies, will continue to be performed.

Data from all areas of the monitoring program will be published by the Division in the format which has been developed for such publications. These publications will be available to interested persons. The overall monitoring program will document progress towards achieving water quality goals and will point out areas requiring further action.

X. PLAN SUMMARY

BASIN PLAN FUNCTIONS

Basin water quality management plans are required by the Federal Clean Waters Act Amendments of 1972 (PL92-500). The purpose of the basin plan is to establish a framework of pollution abatement actions which will result in the attainment of water quality goals. Such actions include construction of sewers and treatment facilities and additional planning efforts to meet long-term goals. The latter include two types of plans specified by the federal act: Section 201 Municipal Facilities Plans and Section 208 Areawide Waste Treatment Management Plans. The Westfield River Basin Plan has been prepared under the authority and methodology described in the Massachusetts Continuing Planning Process. This basin plan represents the abatement strategy of the Massachusetts Division of Water Pollution Control for the Westfield River Basin. Implementation of the basin plan recommendations will be accomplished through the discharge permit program (National Pollutant Discharge Elimination System).

EXISTING WATER QUALITY PROBLEMS

The waters of the upper portion of the Westfield River are generally unpolluted owing to the sparse population and lack of industry. The West Branch of the Westfield River from the Town of Chester to its confluence and the upper reaches of the main stem of the Westfield River are degraded by the discharge of untreated sewage from the towns of Chester and Huntington. Survey results show continual violations of Class B coliform criteria in this area.

In the Town of Russell, the Westfield River receives a large discharge of untreated paper waste from Strathmore Paper Company. Due to high stream reaeration rates, dissolved oxygen criteria are violated only under low flow conditions. However, high solids and color degrade the river and raw sewage from the mill houses raises coliform levels.

The Westfield River, from the confluence of the Little River to the West Springfield dam, bears the assimilative burden of untreated combined sewers in the City of Westfield and carryover from upstream sources of pollution and discharges to the Little River. In recent years dissolved oxygen violations have not occurred in this segment. This was due to the treatment facility in the City of Westfield, treatment at the lower Stevens Mill, and decreased production at the upper Stevens Mill. But rising sludge, high total coliform densities, and residual color from paper-making operations combined to make this segment the most grossly polluted on the Westfield River.

In addition to point sources of pollution, the 1974 water quality survey pointed out two potential areas of non-point pollution. One source is along the Little River below Cobble Mountain Reservoir where erosion rates are high and pasture land abuts the river, the other is in the lower reaches of the main stem of the Westfield as it flows through the most densely populated section of the basin where the river is subject to urban runoff.

WATER QUALITY STANDARDS AND GOALS

The legal authority of this basin plan and its implementation through the permit program is based on the Massachusetts Water Quality Standards as revised in May 1974. Stream classifications for the Westfield River Basin under these standards are shown in Figure II-1. This basin plan recommends that all segments on the Westfield River and its tributaries remain at their present classifications at this time. The one Class C segment in the basin, Segment 7 on the Little River, will be reviewed for upgrading to Class B after the results of the 1978 water quality survey have been analyzed by Division personnel. At this time, it is not expected that this upgrading will require major new construction or stricter effluent limitations on the present discharges. Completion of this upgrading is necessary in order for the waters of the Westfield River Basin to meet the 1983 goals of swimmable/fishable.

The revised water quality standards require the reclassification of all waters in the Commonwealth. This reclassification includes the application of the anti-degradation provision, which prohibits new discharges to streams not subject to municipal discharges. Public hearings on the reclassification of the basin will be conducted in conjunction with the public participation program for the basin plan.

ABATEMENT STRATEGY

The major water quality problems in the Westfield River Basin stem from point sources of pollution. Construction of proper treatment facilities along with some modification of operating procedures at existing facilities are expected to result in the Westfield River meeting its present water use classification. Based on the most recent survey data, five major new construction projects are needed. In order of priority, they are:

1. Construction of treatment facilities at Strathmore Paper Company.
2. Extension of the sewer system in the City of Westfield.
3. Construction of a secondary treatment facility in the Town of Chester. This plan recommends that this be a joint facility including Bendix Abrasives.
4. Construction of a secondary treatment plant in the Town of Huntington.
5. Extension of the sewer system in the Town of Russell and the construction of a treatment facility to handle the sanitary wastes from Strathmore Paper Company and the Village of Woronoco.

The complex problems of dealing with a water quality limited segment have been worked out by the Division and Strathmore Paper Company, and the construction of its treatment facility will commence in March of 1976 and meet permit requirements in June of 1977.

The municipalities of Westfield, Chester, Huntington, and Russell all must submit 201 facilities plans during 1975 and 1976, as summarized in the abatement schedule in Table IV-2. The severity ranking for each discharge will be used to make a state-wide priority list. This list will, in part, determine what projects will be given first consideration for available grant monies.

Other major dischargers in the basin are expected to solve their water quality problems by modifications of existing facilities without significant new construction. One exception to this is the Upper Stevens Paper Mill which must complete its treatment facility if the decision is made to reopen the mill. All of these have been issued permits with implementation schedules and effluent limitations.

In the Upper Westfield Basin, problems with malfunctioning subsurface disposal systems will be eliminated by strict enforcement of Article XI of the State Sanitary Code by state and local health officials. The need to eliminate the non-point sources of pollution in the Westfield River Basin is not documented at this time. However, all of the towns in the basin should be required to submit reports detailing how they will dispose of their solid wastes, septage, and the sludge generated at treatment facilities in those towns which operate treatment plants.

Non-point sources of pollution will be further studied during the 1978 intensive water quality survey of the basin. Future 201 Facilities Plans prepared for towns in the Westfield River Basin will be required to contain a section dealing with non-point pollution from stormwater runoff. At this time it has not been determined if an Areawide Waste Treatment Management Plan (Section 208 study) will be prepared for the Westfield River Basin.

MONITORING PLAN IMPLEMENTATION

Implementation of the basin plan recommendations will be monitored by the Division through review of construction and operations reports on abatement facilities, periodic inspection of these facilities, and a program of water quality sampling. Streams, lakes, groundwater, and treatment facility effluents in the basin will be sampled. The sampling program has three goals:

1. To assure that permit conditions are met at all treatment facilities.
2. To assure that required abatement projects result in the desired water quality.
3. To locate any new or unknown pollution problems in the basin.

Key features of the sampling program include: annual sampling of all treatment facilities, baseline surveys of several lakes and ponds in the basin in 1978, and biological studies of the Westfield River. An intensive water quality survey will be conducted in the basin in 1978 to assess the impact of the new treatment facilities which will have been completed in the basin by that date.

The general public also has a role in monitoring the goals and implementation of the basin plan. The overall public participation program for pollution abatement efforts in the basin includes meetings and hearings on the basin plan, water quality classifications, discharge permits, and facilities plans.

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APPENDIX 1

GLOSSARY OF TERMS

ADMINISTRATIVE

Water Quality Standards - Originally established by the Division in 1967 and revised in 1974, the standards consist of three major parts:

Definition of Classification - The water use classifications (A,B,C, SA,SB,SC) in terms of appropriate uses and chemical constituents.

Application of Classification - Each waterbody in the Commonwealth is assigned a future use classification based on existing and desired uses. An estimate of existing water quality is also made under "Present Condition".

Implementation Schedule - A schedule of abatement actions has been established for each waste discharge in the Commonwealth in order to attain the desired use classification for each waterbody.

Segment - A section of a waterbody with common water quality characteristics and use classification. Waterbodies are divided into segments in order to rank the impact of individual waste discharges.

Segment Classification - This classification required by federal guidelines is based on the pollution control measures required to meet water quality standards. The required classifications are:

Effluent Limited - Segments where the application of Best Practicable Treatment (BPT) to each discharge will result in the attainment of water quality goals.

Water Quality Limited - Segments where higher degrees of treatment than BPT are required to meet existing standards.

These classifications are usually abbreviated "EL" and "WQ" with a number 1 or 2 following. A "1" indicates that standards are now being met; a "2" indicates they are not. An additional segment classification is required by the Massachusetts Water Quality Standards.

Anti-degradation - A segment which receives no waste discharges and is upstream of any existing discharges. New discharges to such segments are prohibited under the Massachusetts Standards.

Best Practicable Treatment - The minimum degree of treatment as prescribed by EPA. For municipal discharges, this is secondary treatment. For industrial discharges, guidelines are being developed by EPA for each type of industry.

Reach - A section of a waterbody with common water quality and hydraulic characteristics. This division of a waterbody is made for mathematical modelling purposes. In practically all cases, a segment consists of several reaches.

Permit Program - The National Pollutant Discharge Elimination System whereby each discharge to a waterbody must apply for and receive a permit. Each permit consists of two major parts.

Effluent Limitations: The maximum amount which may be discharged in terms of quantity and quality for the period of the permit (a maximum of five years).

Compliance Schedule: A schedule of abatement actions for the discharge which will lead to attainment of water quality goals.

At the completion of the compliance schedule, a new permit will be issued with new effluent limitations. For example, an existing treatment facility which causes violations of water quality standards would be required to maintain at least the existing level of treatment under the effluent limitations section of the permits. The compliance schedule would require the construction of additional treatment to meet the standards. At the completion of that construction, a new permit would be issued with effluent limitations necessary to maintain standards.

Monitoring Program - The entire sampling program required by federal regulations and carried out by the states. The program consists of seven elements: intensive water quality surveys, biological monitoring, automatic water quality monitors, National Water Quality Surveillance Sampling network, lake monitoring, compliance (waste discharge) monitoring, and groundwater monitoring.

AGENCIES

The Division - The Massachusetts Division of Water Pollution Control (MDWPC)

EPA - The United States Environmental Protection Agency.

Corps - The United States Army Corps of Engineers.

USGS - The United States Geological Survey.

PHS - The United States Public Health Service.

Public Health - The Massachusetts Department of Public Health, Division of Environmental Health.

OSPM - Office of State Planning and Management.

RMPC - Resource Management Policy Council.

EOEA - Executive Office of Environmental Affairs.

DNR - Massachusetts Department of Natural Resources.

RPA - Regional Planning Agency, of which there are 12 in Massachusetts:

BCRPC - Berkshire County Regional Planning Commission

CCPEDD - Cape Cod Planning and Economic Development District

CMRPC - Central Massachusetts Regional Planning Commission

DCPEDD - Dukes County Planning and Economic Development District

FCDP - Franklin County Department of Planning

LPVRPC - Lower Pioneer Valley Regional Planning Commission

MAPC - Metropolitan Area Planning Council

MRPC - Montachusett Regional Planning Commission

MVPC - Merrimack Valley Planning Commission

NMAC - Northern Middlesex Area Commission

OCPC - Old Colony Planning Council

SRPEDD - Southeast Regional Planning and Economic Development District

Dissolved Oxygen (DO) - The uncombined oxygen in water which is available to aquatic life; DO is therefore the critical paramater for fish propagation. Numerous factors influence DO, including organic wastes, bottom deposits, stream hydraulic characteristics, nutrients, and aquatic organisms. Most mathematical models simulate the impact of these factors on stream DO concentrations. Saturation DO, or the theoretical maximum value, is primarily a function of temperature. DO values in excess of saturation are usually the result of algal blooms and therefore indicate an upset in the ecological balance. Optimum DO values range from 6.0 mg/l (minimum allowable for cold water fisheries) to saturation values. The latter range from 14.6 mg/l at 0° C (32° F) to 6.6 mg/l at 40° C (104° F).

Biochemical Oxygen Demand (BOD) - The amount of oxygen required by bacteria to stabilize organic matter. Biochemical refers to the fact that a chemical change is carried out by biological organisms (bacteria). BOD consists of two parts, carbonaceous and nitrogenous. The carbonaceous portion occurs first; compounds of carbon are broken down with the carbon released combining with oxygen to form carbon dioxide. In the nitrogenous portion, organic compounds of nitrogen are broken down to ammonia which in turn is converted to hydrogen gas and, successively, nitrite and nitrate. Although the total BOD of a waste may take 30 days or more to exert itself, the portion exerted after 5 days has become the standard test through recurrent usage. The 5 day BOD of untreated sewage normally ranges from 150 to 300 mg/1. Streams not subject to pollution will normally have 5 day BOD's of 2.0 mg/1 or less.

Coliform Bacteria - Found in abundance in the intestinal tract of warm-blooded animals. Although not harmful themselves, the presence of coliforms often indicates that pathogenic bacteria are also present. Since they can be detected by relatively simple test procedures, coliforms are used to indicate the extent of bacterial pollution. Tests are often conducted to measure the total and fecal coliform. Fecal coliform make up about 90 per cent of the coliforms in fecal matter. Non-fecal coliform may originate in soil, grain, or decaying vegetation. Untreated sewage contains upwards of 20,000,000 coliforms per 100 milliliters. The legal maximum for swimming areas is 1000 coliform per 100 ml, while for public water supplies it is 100 per 100 ml.

pH - A measure of the hydrogen ion concentration of a solution on an inverse logarithmic scale ranging from 0 to 14. Values from 0 to 6.9 indicate acidic solutions, while values from 7.1 to 14 indicate alkaline solutions. A pH of 7.0 indicates a neutral solution. Natural streams usually show pH values between 6.5 and 7.5, although higher and lower values may be caused by natural conditions. Low pH values may result from the presence of heavy metals from acid mine drainage or metal finishing waste. High pH values may result from detergents or limestone quarrying.

Nutrients - Essentially, nutrients are food for aquatic organisms. They are organic compounds made up of carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur. Small amounts are vital to the ecological balance of a waterbody. Larger amounts can lead to an upset of the balance by allowing one type of organism, such as algae, to proliferate. The most significant nutrients in waterbodies are those of carbon, nitrogen, and phosphorus. Nutrients of carbon are measured indirectly in the BOD test; separate tests are run to measure nutrients of nitrogen and phosphorus.

Milligrams per Liter (mg/l) - The metric system is used to express concentrations in water chemistry because it allows simpler calculations than the English System. The basis of the metric system is the unit weight and volume of water at standard conditions (20° C). At these conditions, one milliliter of water equals one cubic centimeter and weighs one gram. One milligram per liter is therefore essentially equal to one part per million by weight or volume.

Point Source - A continuous discharge of pollutants through a pipe or similar conduit. Primarily included are sewage and industrial wastes, whether treated or untreated.

Non-point Source - Any source of pollution not defined above. Sources such as urban stormwater runoff, which may reach a waterbody either through a pipe or directly, are included in this category since point source control technology (construction of sewers and treatment plants) is usually not feasible for such sources.

Combined Sewers - In many older cities, one system of sewers carries both storm water and sewage, hence the name "combined". Such systems have numerous overflows to the nearest waterbody. These overflows are considered point sources of pollution.

APPENDIX 2

COMMONWEALTH OF MASSACHUSETTS
WATER RESOURCES COMMISSION
DIVISION OF WATER POLLUTION CONTROL

RULES AND REGULATIONS FOR THE ESTABLISHMENT OF MINIMUM WATER QUALITY STANDARDS AND FOR THE PROTECTION OF THE QUALITY AND VALUE OF WATER RESOURCES

The Division of Water Pollution Control, acting under the authority of Sections 27 (5) and (12) of Chapter 21 of the General Laws and other Acts relating thereto enabling, hereby adopts and established the following Rules and Regulations to restore, maintain, and enhance the quality of the waters of the Commonwealth; to designate the uses for which the various waters of the state shall be maintained and protected; to prescribe the water quality standards required to sustain the designated uses; and prescribe regulations necessary for implementing, achieving and maintaining the prescribed water quality.

Filed with Secretary of State May 2, 1974

RULES AND REGULATIONS
FOR THE ESTABLISHMENT OF
MINIMUM WATER QUALITY STANDARDS
AND FOR THE PROTECTION OF THE
QUALITY AND VALUE OF WATER RESOURCES

REGULATION I Definitions

The terms used in the following regulations are defined as follows:

1. Appropriate Treatment - means that degree of treatment required for the waters of the Commonwealth to meet their assigned classifications or any terms, conditions, or effluent limitations established as part of any permit to discharge issued under the provisions of the Massachusetts Clean Waters Act, or any effluent standard or prohibition established by the Division under authority of Section 27 (6) of the Massachusetts Clean Waters Act.

2. Division - means the Commonwealth of Massachusetts, Division of Water Pollution Control.

3. Person - means any agency or political subdivision of the Commonwealth, public or private corporation or authority, individual, partnership or association, or other entity, including any officer of a public or private agency or organization, upon whom a duty may be imposed by or pursuant to any provision of Sections 26-53 inclusive, of Chapter 21 of the General Laws.

4. Sewage - means the water-carried waste products or discharges from human beings, sink wastes, wash water, laundry waste and similar so-called domestic waste.

5. The "Waters of the Commonwealth" and "Waters" - means all waters within the jurisdiction of the Commonwealth, including, without limitation, rivers, streams, lakes, ponds, springs, impoundments, estuaries, coastal waters, and ground waters.

6. Fresh Waters - means waters not subject to the rise and fall of the tide.

7. Salt Waters - means all waters subject to the rise and fall of the tide.

8. Cold Water Stream - means a stream capable of sustaining a population of cold water fish, primarily Salmonids.

9. Seasonal Cold Water Stream - means a stream which is only capable of sustaining cold water fish during the period of September 15 through June 30.

10. Waste Treatment Facility - processes, plants, or works, installed for the purpose of treating, neutralizing, stabilizing or disposing of wastewater.

11. Pollutant - means any element or property of sewage, agricultural, industrial, or commercial waste, run-off, leachate, heated effluent, or other matter in whatever form and whether originating at a point or non-point source, which is or may be discharged, drained or otherwise introduced into the waters of the Commonwealth.

12. Discharge - means the flow or release of any pollutant into the waters of the

Commonwealth.

13. Wastewater - means sewage, liquid or water-carried waste from industrial, commercial, municipal, private or other sources.

14. Zone of Passage - means a continuous water route of the volume, area and quality necessary to allow passage of free-swimming and drifting organisms with no significant effect produced on the population.

Regulation II - Water Quality Standards

1 - The Water Quality Standards adopted by the Massachusetts Division of Water Pollution Control on March 3, 1967 and filed with the Secretary of State on March 6, 1967 are hereby repealed, except that existing "River Basin Classifications" based on the 1967 Standards will remain in full force and effect until reclassified in accordance with the following standards.

2 - To achieve the objectives of the Massachusetts Clean Waters Act and the Federal Water Pollution Control Act Amendments of 1972 and to assure the best use of the waters of the Commonwealth the following standards are adopted and shall be applicable to all waters of the Commonwealth or to different segments of the same waters:

3 - Fresh Water Standards
Class A - These waters are designated for use as sources of public water supply in accordance with the provisions of Chapter 111 of the General Laws.

Water Quality Criteria

Item	Criteria
1. Dissolved oxygen	Not less than 75% of saturation during at least 16 hours of any 24 hour period and not less than 5 mg/l at any time. For cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l. For seasonal cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l during the season.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None allowable
3. Color and turbidity	None other than natural origin.
4. Total Coliform bacteria per 100 ml.	Not to exceed an average value of 50 during any monthly sampling period.
5. Taste and odor	None other than of natural origin.
6. pH	As naturally occurs.
7. Allowable temperature increase	None other than of natural origin.
8. Chemical constituents	None in concentrations or combinations which would be harmful or offensive to humans, or harmful to animal or aquatic life.

9. Radioactivity	None other than that occurring from natural phenomena.

Class B - These waters are suitable for bathing and recreational purposes, water contact activities, acceptable for public water supply with treatment and disinfection, are an excellent fish and wildlife habitat, have excellent aesthetic values and are suitable for certain agricultural and industrial uses.

Item	Criteria
1. Dissolved oxygen	Not less than 75% of saturation during at least 16 hours of any 24 hour period and not less than 5 mg/l at any time. For cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l. For seasonal cold water streams the dissolved oxygen concentration shall not be less than 6 mg/l during the season.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result from the discharge from water treatment facilities providing appropriate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l.
3. Color and turbidity	None in such concentrations that would impair any uses specifically assigned to this class.
4. Coliform bacteria per 100 ml	Not to exceed an average value of 1000 nor more than 1000 in 20% of the samples.
5. Taste and odor	None in such concentrations that would impair any uses specifically assigned to this class and none that would cause taste and odor in edible fish.
6. pH	6.5 - 8.0
7. Allowable temperature increase	None except where the increase will not exceed the recommended limit on the most sensitive receiving water use and in no case

	exceed 83° F in warm water fisheries, and 68°F in cold water fisheries, or in any case raise the normal temperature of the receiving water more than 4°F.
8. Chemical constituents	None in concentrations or combinations which would be harmful or offensive to human, or harmful to animal or aquatic life or any water use specifically assigned to this class.
9. Radioactivity	None in concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Class B1 - The use and criteria for Class B1 shall be the same as for Class B with the exception of the dissolved oxygen requirement which shall be as follows for this class:

Item	Criteria
1. Dissolved oxygen	Not less than 5 mg/1 during at least 16 hours of any 24 hour period, nor less than 3 mg/1 at any time. For seasonal cold water fisheries at least 6 mg/1 must be maintained during the season.

Class C - These waters are suitable for recreational boating and secondary water contact recreation, as a suitable habitat for wildlife and fish indigenous to the region, for certain agricultural and industrial uses, have good aesthetic values, and under certain conditions are acceptable for public water supply with treatment and disinfection.

Item	Criteria
1. Dissolved oxygen	Not less than 5 mg/1 during at least 16 hours of any 24 hour period, nor less than 3 mg/1 at any time. For seasonal cold water fisheries at least 6 mg/1 must be maintained during the season.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result

		from the discharge from waste treatment facilities providing appropriate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l.
3.	Color and turbidity	None allowable in such concentrations that would impair any uses specifically assigned to this class.
4.	Coliform bacteria	None in such concentrations that would impair any usages specifically assigned to this class, see Note 1.
5.	Taste and odor	None in such concentrations that would impair any uses specifically assigned to this class, and none that would cause taste and odor in edible fish.
6.	pH	6.0 - 8.5
7.	Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive receiving water use and in no case exceed 83°F in warm water fisheries, and 68°F in cold water fisheries, or in any case raise the normal temperature of the receiving water more than 4°F.
8.	Chemical constituents	None in concentrations or combinations which would be harmful or offensive to human life, or harmful to animal or aquatic life or any other water use specifically assigned to this class.
9.	Radioactivity	None in such concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Note I - no bacteria limit has been placed on Class "C" waters because of the urban runoff and combined sewer problems which have not yet been solved. In waters of this class not subject to urban runoff or combined sewer discharges the bacterial quality of the water should be less than an average of 5,000 coliform bacteria/100 ml during any monthly sampling period. It is the objective of the Division to eliminate all point and non-point sources of pollution and to impose bacterial limits on all waters.

Class C1 - The use and criteria for Class C1 shall be the same as for Class C with the exception of the dissolved oxygen (and temperature) requirements which shall be as follows for this Class:

Item	Criteria
1. Dissolved oxygen	Not less than 2 mg/l at any time.

Salt Water Standards

Class SA - These are waters of the highest quality and are suitable for any high water quality use including bathing and other water contact activities. These waters are suitable for approved shellfish areas and the taking of shellfish without depuration, have the highest aesthetic value and are an excellent fish and wildlife habitat.

Water Quality Criteria

Item	Criteria
1. Dissolved oxygen	Not less than 6.5 mg/l at any time.
2. Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result from the discharge from waste treatment facilities providing appropriate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l.
3. Color and turbidity	None in such concentrations that will impair any uses specifically assigned to this class.
4. Total Coliform bacteria per 100 ml	Not to exceed a median value of 70 and not more than 10% of the samples shall ordinarily exceed 230 during any monthly sampling period.
5. Taste and odor	None allowable
6. pH	6.8 - 8.5

7.	Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.
8.	Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other uses.
9.	Radioactivity	None in concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Class SB - These waters are suitable for bathing and recreational purposes including water contact sports and industrial cooling, have good aesthetic values, are an excellent fish habitat and are suitable for certain shell fisheries with depuration (Restricted Shellfish Areas).

Item		Criteria
1.	Dissolved oxygen	Not less than 5.0 mg/l at any time.
2.	Sludge deposits-solid refuse-floating solids-oils-grease-scum	None other than of natural origin or those amounts which may result from the discharge from waste treatment facilities providing adequate treatment. For oil and grease of petroleum origin, the maximum allowable concentration is 15 mg/l.
3.	Color and turbidity	None in such concentrations that would impair any uses specifically assigned to this class.
4.	Total Coliform bacteria per 100 ml	Not to exceed an average value of 700 and not more than 1000 in more than 20% of the samples.
5.	Taste and odor	None in such concentrations that would impair any uses specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish.
6.	pH	6.8 - 8.5

7.	Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.
8.	Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the water for any other use.
9.	Radioactivity	None in such concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Class SC - These waters are suitable for aesthetic enjoyment, for recreational boating, as a habitat for wildlife and common food and game fishes indigenous to the region, and are suitable for certain industrial uses.

Item		Criteria
1.	Dissolved oxygen	Not less than 5 mg/l during at least 16 hours of any 24 hour period nor less than 3 mg/l at any time.
2.	Sludge deposits-solid refuse-floating solids-oil-grease-scum	None other than of natural origin or those amounts which may result from the discharge from waste treatment facilities providing appropriate treatment. For oil and grease of petroleum origin the maximum allowable concentration is 15 mg/l
3.	Color and turbidity	None in such concentrations that would impair any uses specifically assigned to this class.
4.	Total Coliform bacteria	None in such concentrations that would impair any uses specifically assigned to this class. See Note 2
5.	Taste and odor	None in such concentrations that would impair any uses specifically assigned to this class and none that would cause taste and odor in edible fish or shellfish
6.	pH	6.5 - 8.5
7.	Allowable temperature increase	None except where the increase will not exceed the recommended limits on the most sensitive water use.

8. Chemical constituents	None in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe for fish or shellfish or their propagation, impair the palatability of same, or impair the water for any other use.
9. Radioactivity	None in such concentrations or combinations in excess of the limits specified by the United States Public Health Service Drinking Water Standards.

Note 2: no bacteria limit has been placed on Class "SC" waters because of the urban runoff and combined sewer problems which have not yet been solved. In waters of this class not subject to urban runoff or combined sewer discharges, the bacterial quality of the water should be less than an average of 5,000 coliform bacteria/100 ml during any monthly sampling period. It is the objective of the Division to eliminate all point and non-point sources of pollution and to impose bacterial limits on all waters.

Regulation III - General Provisions

1. It is recognized that certain waters of the Commonwealth possess an existing quality which is better than the standards assigned thereto.

   A. Except as otherwise provided herein, no new discharge of wastewater will be permitted into any stream, river or tributary upstream of the most upstream discharge of wastewater from a municipal waste treatment facility or municipal sewer discharging wastes requiring appropriate treatment as determined by the Division. Any person having an existing wastewater discharge shall be required to cease such discharge and connect to a municipal sewer unless it is shown by said person that such connection is not available or feasible. Existing discharges not connected to a municipal sewer will be provided with the highest and best practical means of waste treatment to maintain high water quality. New discharges from a municipal waste treatment facility into such waters will be permitted provided that such discharge is in accordance with a plan developed under the provisions of Section 27(10) of Chapter 21 of the General Laws (Massachusetts Clean Waters Act) which has been the subject of a Public Hearing and approved by the Division. The discharge of industrial liquid coolant wastes in conjunction with the public and private supply of heat or electrical power may be allowed provided that a permit has been issued by the Division and that such discharge is in conformance with the terms and conditions of the permit and in conformance with the water quality standards of the receiving waters.

   B. Except as otherwise provided herein, no new discharge of wastewater will be permitted in Class SA or SB waters. Any person having an existing discharge of wastewater into Class SA or SB waters will be required to cease said discharge and to connect to a municipal sewer unless it is shown by said person that such connection is not available or feasible. Existing discharges not connected to a municipal sewer will be provided with the highest and best practical means of waste treatment to maintain high water quality. New discharges from a waste treatment facility into such waters will be permitted provided such discharge is in accordance with a plan developed under the provisions of Section 27(10) of Chapter 21 of the General Laws (Massachusetts Clean Waters Act) which has been the subject of a Public Hearing and approved by the Division. The discharge of industrial coolant wastes in conjunction with the public and private supply of heat or electrical power may be allowed provided that a permit has been issued by the Division and that such discharge is in conformance with the terms and conditions of the permit and in conformance with the Water Quality Standards of the receiving waters.

2. The latest edition of the Federal publication "Water Quality Criteria" will be considered in the interpretation and application of bioassay results.

3. The latest edition of Standard Methods for Examination of Water and Wastewater, American Public Health Association, will be followed in the collection, preservation, and analysis of samples. Where a method is not given in the standards methods, the latest procedures of the American Society for Testing Materials (ASTM) will be followed.

4. The average minimum consecutive 7-day flow to be expected once in 10 years shall be used in the interpretation of the standards.

5. In the discharge of waste treatment plant effluents into receiving waters, consideration shall be given both in time and distance to allow for mixing of effluent and stream. Such distances required for complete mixing shall not effect the water use classifications adopted by the Division. However, a zone of passage must be provided wherever mixing zones are allowed.

6. There shall be no new discharges of nutrients into lakes or ponds. In addition, there shall be no new discharge of nutrients to tributaries of lakes or ponds that would encourage eutrophication or growth of weeds or algae in these lakes or ponds.

7. Any existing discharge containing nutrients in concentrations which encourage eutrophication or growth of weeds or algae shall be treated to remove such nutrients to the maximum extent technically feasible.

8. These Water Quality Standards do not apply to conditions brought about by natural causes.

9. All waters shall be substantially free of products that will (1) unduly affect the composition of bottom fauna, (2) unduly affect the physical or chemical measure of the bottom, (3) interfere with the spawning of fish or their eggs.

10. No person shall discharge any pollutants into any waters of the Commonwealth which shall cause a violation of the standards.

11. A person shall submit to the Division for approval all plans for the construction of or addition to any waste treatment facility and no such facility may be constructed, modified or enlarged without such approval.

12. Cold water and seasonal cold water streams shall be those listed by the Massachusetts Division of Fisheries and Game.

13. Whoever violates any provision of these regulations shall (a) be fined not less than two thousand five hundred dollars nor more than twenty-five thousand dollars for each day of such violation or its continuance, or by imprisonment for not more than one year, or by both; or (b) shall be subject to a civil penalty not to exceed ten thousand dollars per day of such violation, which may be assessed in an action brought on behalf of the Commonwealth in any court of competent jurisdiction, pursuant to Section 42 of Chapter 21 of the Massachusetts General Laws.

14. The Division and its duly authorized employees shall have the right to enter at all reasonable times into or on, any property, public or private, for the purpose of inspecting and investigating conditions relating to pollution or possible pollution of any waters of the Commonwealth, pursuant to Section 40 of Chapter 21 of the Massachusetts General Laws.

15. If any regulation, paragraph, sentence, clause, phrase or word of these regulations shall be declared invalid for any reason whatsoever, that decision shall not affect any other portion of these regulations, which shall remain in full force and effect and to this end the provisions of these regulations are hereby declared severable.